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International Inland Navigation.

THE subject of Inland Navigation, which has been frequently referred to in the *Builder* as of growing national importance, has lately received a decided impetus in the remarkable International Conference recently held at Brussels. Though not surprising, seeing the almost culpable apathy with which the question has been treated in our own country, yet it is somewhat singular that, appreciated as water-carriage is by the great States of Europe generally, it has been left for the small State of Belgium to inaugurate so important a Congress as that lately summoned to its capital. The detailed account* of the papers laid before it, and of the several discussions thereon, have only been recently made available in this country, and form so valuable a contribution to the question of internal communications generally as to deserve more than a passing notice.

His Majesty the King of the Belgians is to be congratulated on the success with which, at the recommendation of his able Minister of Public Works, Chevalier de Moreau, so large an assembly of statesmen, savants, and engineers were collected together to discuss the important subject of water transit. Austria, France, Germany, Great Britain, Holland, Italy, Norway, Portugal, Russia, and Switzerland, as well as Brazil and Canada, all sent their delegates to assist at the deliberations of the Belgian representatives. The most recent experiences, together with the most matured opinions of each country, were freely contributed, and with a singular unanimity of testimony demonstrated not only the superior economy and profit conferred by water carriage to the general community of a State, without, at the same time, injuriously affecting the interests of its great rival, the railways; but further, the absolute necessity that exists of providing for a large description of goods a cheaper mode of transit than it is possible for railways to afford.

The question, having thus assumed an international character, has been lifted out from the region of comparatively local discussions to which it has hitherto been confined, and has attained such a prominent position in Europe generally, as cannot fail to secure a practical result in placing, sooner or later, the carrying trade on a sound and economical basis, and so remedying the anomalies and penalties which the powerful combination of railways had succeeded in imposing on the producer, manufacturer, and consumer alike.

The programme set before the Congress contained several points involving technical as well as economic considerations on canals in general, both inland and maritime, and these were severally dealt with by sub-committees, which, after a primary discussion at the general sittings of all the members, deliberated on such points as had elicited divergence of opinion, or on which the experiences of specialists were desired, and then submitted their several reports to the final sitting of the Congress. Though many important details were discussed therein, yet, as it is more the development of canals and water transport generally, and the economic considerations connected therewith, that constitute the pressing question of the day, it is more particularly with that aspect of the subject it is proposed here to deal.

In the paper read by Herr de Beeck on "The Importance of Water Communication," it is stated that in France, out of the public water loan for 200 millions voted for M. de Freycinet's grand schemes, it has been decided to construct, at a cost of five millions, the Canal du Nord for carrying the products of the Pas de Calais and North of France to Paris, while another project for a junction canal between the Garonne and Upper Loire, thus connecting Bordeaux with Bâle, has also been elaborated. In England the Manchester and Liverpool Canal has at last received the sanction of the Legislature. In Holland there is the Grand Northern Canal for connecting Amsterdam with the Helder, as also that which gives that city access to the North Sea, and which, as respects traffic and working capabilities, is of exceptional importance. In Germany a network of eight waterways, measuring 750 miles, has been projected by the Government, of which the line from the Weser to the Elbe, 263 miles long, will alone cost about 5½ millions sterling, while the Rostock-Berlin Canal is also of the first importance, placing, as it does, the city of Berlin in direct communication with the Baltic. This development of waterways in Germany is all the more remarkable as showing that though the Government hold a monopoly of the railways, they nevertheless attach the highest value to water transit. In Canada the Government have been expending ten millions sterling on the construction of ship canals with a capacity sufficient for the passage of vessels of 1,800 tons burthen. The system comprises the Welland Canal, which, turning the Falls of Niagara, connects Lake Ontario with Lake Erie, and seven lateral canals to the St. Lawrence. These lines compete directly with five great lines of railway, which serve the State of New York, and will absorb the greater part of the grain traffic of the country lying between the Western States and the Atlantic; and there appears little reason to doubt but that they will afford an additional proof of the superior economy of water transit. M. de Lesseps two great isthmus canals also come under the category of modern waterways. Indeed, there are signs on every side that by the construction of canals endeavours are being made to counteract the differential and arbitrary rates created by the railway combination. The writer of the paper next passes on to consider the somewhat vexed subject as to the State holding a proprietary right in the waterways. From a Continental point of view there would seem to be little doubt of its expediency, but at present, judging from the opinions expressed in the Canals Committee of 1883, the public is not prepared to acquiesce in such an arrangement for England, though no very clear reasons have ever been advanced as to why the Government should not assume the same power over its waterways that it has taken over its postal and telegraph arrangements. As far as Belgium itself is concerned, the State possesses a monopoly of the railways, and therefore it is but consistent to keep in its own hands its waterways as regards proprietary rights; but even then the working of the canals would probably be better left to private enterprise, as competition would effectually keep down rates and charges to the lowest figure. The influence of the State, however, could be properly and profitably exercised in regulating the management as well as in maintaining a uniformity of rates and tolls, and so removing one of the existing impediments to a successful working of its waterways. It is difficult to see how, as has been recommended, a total abolition of tolls is to be effected if any return is to be obtained for the capital outlay, by whomsoever made, unless, indeed, a canal be worked like a railway,—solely by the Government or company who constructs it; but such a proceeding would only accentuate for the public, the existing difficulties from which competition alone can seemingly deliver it. It is well pointed out also by the same writer that the old argument used by railway advocates to the effect that facility and rapidity, so essential to modern traffic, are only obtainable by railways, leaves out of sight the fact that it is quite possible to secure both regularity and speed equally on canals, for as yet nothing has been attempted in that direction. The rate of speed depends principally on the sectional area given to canals, but as to the

* Mémoires publiés à l'Occasion du Congrès International de Navigation Intérieure tenu à Bruxelles du 24 Mai au 2 Juin, 1885. Bruxelles Imprimerie: H. Luphens Père; Dr. Ch. Maladry, 38, Rue des Foulons. 1885.

carrying capacity there is no sort of comparison between the two modes of conveyance, inasmuch as on canals every boat can move at exactly the speed best suited to the cargo it carries, without in any way hindering the rate of travelling of any other boat, whereas every wagon on a railway must move at the speed of the train of which it forms a part, irrespective of the value or bulk of the articles with which it is laden. The truth, however, is that there is ample room for both methods of transport, and, when properly regulated, it will be found that, so far from any injurious rivalry, the traffic best suited to it will gradually find its way by each mode to the advantage of both.

On the three canals of Neuffosé, d'Aire à la Bassée, and de Haute Deûle, three modes of traction are resorted to, viz., horse haulage, traction engines running on rails laid on the towing-path, and steam-tugs working a submerged chain. The traffic on those three canals last year amounted to

On the Canal de Neuffosé ...	1,015,000	tons.
,, d'Aire	1,223,786	,,
,, de Haute Deûle	1,350,000	,,

In 1882, the Steam Tug Company alone conveyed 32 million ton kilomètres at a price of 4 millimes per ton per kilomètre, or 1-18th of a penny per ton mile. These canals are navigated by vessels measuring 126 ft. in length, 16 ft. beam, and 6 ft. draught, and carrying 300 tons.

In Germany and Austria, the development of water-traffic has been most remarkable. Prof. Schlichting states that the trade on the Spree, at Berlin, which, in 1850, amounted to 1,200,000 tons, had, in 1884, risen to 3,700,000 tons. That on the Elbe, at Hamburg, had mounted from 450,000 tons, in 1852, to 2,400,000 tons in 1883; while the traffic on the Rhine, at Emmerich, had risen from 550,000 tons in 1850 to 4,500,000 tons in 1883; in other words, the trade on these three lines had increased between three and eight fold in thirty-six years,—a signal proof of the appreciation awarded to water transport.

In an admirable paper, M. de St. Hubert, a delegate from Austria, after describing the Danube as the principal artery of inland navigation in Europe, with a course of 2,500 miles, from its source near the Lake of Constance (with which a connexion might easily be made) to the Sulina mouths on the Black Sea, states his conviction that at no very distant date the carriage of all the products of Central and Western Europe would take that route to the Caspian and Central Asia, toward which, in his opinion, the commerce of Europe must eventually find a principal outlet, and that therefore the improvement of the Danube, in regard to the depth of its navigable channel, is an object of the first importance. Already, by the construction of the canal from Mayence to Frankfort, the first step towards a junction of the Rhine with the Danube will have been accomplished, while, by the canalisation of the Maine and the enlargement of the Ludwig Canal, the large cities of Aschaffenberg, Wurburg, Bamberg, Nuremberg, &c., will be placed in direct navigable communication with Vienna, the central capital of Europe. Already, projects are afloat for the junction of the Danube with the Baltic and the North Sea, by means of the Donau-Oder and Donau-Elbe Canals, so tending to constitute Vienna an inland port, while the connexion of Paris, Brussels, Berlin, and Vienna, by first-class waterways, will complete the development of the vast trade which is carried on between the ports of Havre, Antwerp, London, Hamburg, Stettin, and the Black Sea. Taking the data contained in M. Perdonnet's work on "Traffic Statistics," M. de St. Hubert claims an advantage of 2·63 centimes per ton kilomètre in favour of water-carriage, and calculates that, on a traffic moderately estimated at 1,200,000 tons over 625 miles, there would be an annual saving to the public of three millions sterling.

In Holland the adaptability of canals as the chief mode of conveyance goes without saying, but at the same time it is probable that the actual statistics of water-borne traffic in that country are not very generally known. According to Mr. Stieltjies they are as follow :—

In 1881 the total imports amounted to 10,326,000 tons (1,000 kilos.), of which 75·5 per cent. was water-borne, viz. :—

3,884,000 tons, or 37·5 per cent., went along the rivers ;
3,909,000 tons, or 38 per cent., were carried by sea ; while
2,532,000 tons, or 24·5 per cent., only were carried by rail and road.

The exports amounted to 4,751,000 tons, of which—

2,185,000 tons went out by the rivers ;
1,147,000 tons were carried by sea ; and
1,419,000 tons were transported by rail.

That is, three-fourths of the whole external trade was water-borne, a result all the more remarkable seeing that the neighbouring States of Germany and Belgium, furnishing 64 and 81 per cent. of their whole trade, are in direct communication with Holland by several lines of railway. In Holland, moreover, the canals are utilised, not simply for the carriage of goods, but are frequented largely by passengers, the number of steamers increasing yearly on the Netherland lines, there being at the present time 213 regular steamboat services travelling at speeds varying from 5 to 10½ miles per hour.

It is disappointing to find that, with the exception of Mr. Leader-Williams's paper on the Manchester Ship Canal, there was no representative to describe the working of canals in England, or to furnish extracts from the evidence taken before the Parliamentary Canals Committee of 1883, in which so much valuable information was afforded, and when the remarkable economy of water-carriage was exemplified by the results obtained on the Aire and Calder Canal. Besides those already quoted there were several excellent contributions by Continental authorities, as, for example, a paper by Herr De Beeck on the working of canals generally; another by M. Huet on the best method of supplying water to the upper reaches of canals; and a particularly able paper by M. Vandrunen on the future of canals, and on the comparative merits of hydraulic lifts and inclined planes. M. Jacquier, of the Ponts et Chaussées Department, also contributes an exhaustive note on the construction of inclined planes and their relative economy with hydraulic lifts, showing that though the working expenses of both methods are about equal, the inclined plane is much the cheaper work in first construction. A paper on river navigation and towage by endless chain, which has a special application to the difficulties encountered on the Rhone, is well worth perusal. The expediency of adopting it on canals is, however, not so clear; for one of the special advantages claimed for it is the ease and safety with which large vessels may be handled in a strong current; but of its economy there is no question, though it does not seem to have reached the low figure at which the Aire and Calder boat-trains are worked. An exhaustive history of the important network of waterways which are comprised in the Canal de l'Est, in France, occupies a large section of the report presented to the Congress, but it is a project of the highest importance and value to the countries which it subserves, and reflects great credit on the Government of France and on the distinguished statesman with whose name is associated the magnificent scheme of public works before alluded to. When completed, it will have cost about four millions sterling, and will bring into direct connexion no less than five important rivers,—the Meuse, Moselle, Marne, Rhine, and Saone,—by which means produce may eventually be carried from the North to the South of France.

The reunion at Brussels of so many able and thoughtful men, devoting a considerable portion of their valuable time to the discussion of waterways, with a view to their international utilisation, cannot but be viewed as a most important demonstration and protest against the high-handed proceedings of the railways, and as a new departure in the matter of transport, and the first step towards the inauguration of, or, rather, return to, the only system which can meet the exigencies of the time, and which all nations are beginning to recognise as essential to the maintenance of their respective industries. Before the Congress broke up it was unanimously resolved to constitute a Congress in permanence, and the Austrian delegate, in the name of the civic authorities of Vienna invited all his colleagues to meet next year at that capital. It is to be hoped that Great Britain will be better represented thereat, and that the experiences which the Continental States have given to the world at large will not be lost to our own country, but that those classes of the community more especially interested will unite in setting on foot without delay measures for carrying out the improvements which are so sorely needed for our canals, and which, as was shown by experienced witnesses on the Parliamentary Committee, can be provided at a comparatively small outlay.

SANITARY EXHIBITION AT LEICESTER.

IN connexion with the eighth Congress of the Sanitary Institute of Great Britain, opened at Leicester on Tuesday last, a large exhibition of sanitary apparatus, and materials and appliances connected with sanitary construction, was opened in the Floral Hall by the Mayor. The exhibitions held in connexion with this Institute are noteworthy from the fact that they are always ready by the opening day, a result due to the commendable arrangement whereby the judges commence their examination of the exhibits some three or four days before the exhibition opens, compelling exhibitors who do not want to miss their chance of an award to have their goods placed in position beforehand. The present exhibition may be said to be a fairly representative one of its kind, but we failed to discover many novelties. Several of the exhibits, however, which at first sight would appear to be old friends, are shown with modifications or improvements which will, in most cases, be found worth attention.

Dealing with the stalls in their numerical order, we noted that Messrs. Doulton & Co., of Lambeth (Stall 1), have a very good display of sanitary goods, including a trough closet in stoneware, of pipe section, which, used in conjunction with Doulton's automatic flushing-tank, is one of the best appliances of its kind, and we hope the day is not far distant when such automatic flushing closets (which can be arranged to flush at any desired interval, and the action of which cannot be tampered with) will take the place of the old-fashioned and disgusting latrines which are to be found in many factories. The same firm show their "Combination" closet in a new shape; the "Lambeth Flush-out Closet;" the "Lambeth Trapless Closet;" a very good trough urinal, with automatic flushing arrangement; and a number of their excellent fire-clay stoves. The most interesting exhibit made by this firm is, however, a new form of fireproof construction for floors, known as the "Doulton-Peto" flooring. It consists virtually of a number of fire-clay voussoirs, keyed together so as to form a flat arch between rolled iron joists, the end segments or voussoirs being so shaped as to pass round and over the lower flanges of the joists, so as to completely protect the soffits of the latter from the action of fire. The under-surfaces of these segments or blocks of fire-clay unite to form a flat ceiling, and are capable of affording a good key for the plaster. The floor above can either be of concrete or wood, as may be desired. It is stated to have been tested for strength up to a load of 8 cwt. or 9 cwt. per square foot. We are informed that this method of flooring has been used throughout the new London Pavilion Music-hall, Coventry-street.

At Stall 2, Surgeon-Major Pringle, of the Sanitary Department of her Majesty's Bengal Army, exhibits his patent "Sursum" shield, as applied, firstly, to a household water-cistern, and, secondly, to a cattle-trough. The appliance is one which is well worthy the attention of visitors to the exhibition, as when applied to a household cistern it serves to secure the admission of the water in such a way as to prevent the drawing off of any sedimentary matter which may have accumulated at the bottom of the cistern, while, at the

same time, the water is kept fresh. This appliance can be had for a few shillings, and appears calculated to do away with the necessity for the periodical cleansing of house cisterns,—a necessity which, under existing arrangements, is not fully recognised by the public. It must be owned, however, in extenuation, that very often house cisterns are placed in extremely inaccessible positions, and that even when they are tolerably accessible, there are no means of rapidly emptying them, it being necessary to go through the tedious process of ladling-out all the water below the outlets to the taps. No wonder that under such circumstances the duty of cistern-cleaning is often shirked. The "Sursum" shield is applied to cattle-troughs with the view of getting rid of any impurities which may be blown on to the surface of the water in the troughs.

At Stall 3, Messrs. John Warner & Sons, of London, exhibit Goslin's patent "Ejector Siphon Flushing Cistern," which is a newly-patented arrangement designed to meet the requirements of the Local Government Board and of the water companies, so as to ensure a rapid and effective flush with a limited quantity of water. It is simple in its mechanism, and deserves inspection. John Smeaton's patent "duplex" under-seat water-waste preventing valve, of which Messrs. Warner & Sons are the manufacturers, is simple and effective, and capable of very wide use. It meets the requirements of the New River and other water companies. The "Avalanche" registered closet and trap, shown by these exhibitors, is a very efficient wash-out closet, and is likely to find much favour. The sooner "cottage" closets of this type supersede the elongated conical "hopper" closets,—in which the water, instead of giving an effective flush, gyrates spirally against the surface of the hopper, and loses nearly all its inertia or flushing-power before it reaches the water in the trap,—the better will it be. Among other exhibits shown by the same firm is Goslin's patent expansive boiler-cock, which has for its object the prevention of the explosion of high-pressure or close boilers in kitchens. It is intended to be used as an ordinary draw-off cock, and its construction is such that it appears well calculated to effect the object in view.

Mr. P. A. Maignen, of London, exhibits (Stall 4) his "Filtre Rapide" in its various forms, including those used by our forces in the Soudan expedition. The same exhibitor shows a working model of a water-softening apparatus. At Stall 5 Messrs. E. & J. M. Verity, of Holborn, exhibit Crabtree's patent kitchener, which is shown in action, and appears to possess considerable merit. This exhibit, and the numerous displays of gas cooking and heating stoves, some of which are mentioned hereafter, are placed in an annexe to the Floral Hall. Messrs. H. & C. Davis & Co. (of Camberwell) have a good show of their "Metropolitan" and other gas kitcheners, of the merits of which we have spoken on previous occasions. Stall 11 is occupied by Mr. Harry Hunt, of Stoke Newington, with his "Crown Jewel" and other continuous burning stoves, to which the same remark is applicable. Leoni's "Nonpareil" gas kitcheners and other gas stoves are shown at Stand 13. One merit claimed for them is that they are rustless and require no black-leading, some of the external portions being coated with a species of enamel. Messrs. Ewart & Son, of Euston-road (Stall 15), exhibit a new instantaneous water-heater, termed the "Hausbedarf," which appears likely to find favour in many households. Messrs. John Wright & Co. (Stall 14), Messrs. Somerville & Walker (Stall 16), Messrs. Arden Hill & Co., of Birmingham (Stall 18), and Mr. Thomas Fletcher, F.C.S., of Warrington (Stall 17), are also exhibitors in this section, which is instructive, as showing the efforts that are being made to meet the increasing demand for gas as a fuel for cooking and warming purposes.

Two water-waste preventing flushing cisterns, the "Invicta" and the "Peerless," are exhibited by Messrs. Goode & Co., of Loughborough (Stall 20). From the first, the quantity of water discharged is not under the control of the operator, a stipulated quantity, neither more nor less, being allowed to flow at each pull. In the "Peerless" cistern, on the contrary, the amount of water to be discharged is entirely subject to the will of the user, who may empty the cistern entirely, or only partially.

Stall 21 is tenanted by Mr. J. J. Ellis, of the Ellistown Collieries, who exhibits sanitary stoneware of good quality. Stall 23 is that of Messrs. Fergusson & Starkey, of Leicester, who show some good baths by Shanks & Co., of Barrhead, near Glasgow. Mr. Frank Ashwell (Stand 23), of Leicester, exhibits a dinner-lift by Waygood & Co., of London, and heating and ventilating apparatus as used in some of the schools of the Nottingham School Board, under the direction of Mr. A. N. Bromley and Messrs. T. C. Hine & Sons, the architects. Mr. Ashwell also exhibits Körting's heating and ventilating apparatus, as used in the new Grammar School at Coventry. At the same stand is shown a Blackman air-propeller, worked by a half-horse power "Otto" gas-engine. Messrs. Adams & Co., of York and London, exhibit (Stall 25) a new manhole-cover; while at Stall 26 Mr. William White, of Abergavenny, exhibits the "Hygeian Rock" Building Composition under tests which appear to be conclusive as to the strength and imperviousness of the material. Mr. White also exhibits a specimen piece of walling built with concrete blocks in combination with the composition.

Mr. F. Dyer (Stall 28), of Camden Town, exhibits an air-tight manhole cover and a tidal valve for preventing the admittance of tidal water into sewer outfalls. The valve consists of a chamber enclosing a ball, which is pressed tight against a seating prepared for its reception as the tide rises. The Æolus Water Spray and General Ventilating Company, of London, have a large display (Stall 29) of their well-known specialities in ventilating and warming apparatus, which have been so often described that it is needless to speak of them here in detail. This company also exhibit Keidel's patent "hydro-ventilator," worked by a small jet of water. It can be used either for exhaustion or injection, the change from one to the other method of working being effected by turning a couple of taps so as to reverse the direction in which the jet of water flows. It appears to be a very simple and efficient little contrivance.

Messrs. John Ellis & Sons, of Leicester, exhibit (at Stall 34) examples of their Barrow blue-lias lime, for which (as will be seen by a reference to the list of awards which we print on p. 423) they have been awarded a medal. At Stall 35 ventilators are again to the fore, for here Messrs. C. Kite & Co. exhibit their well-known and long-tried exhaust roof ventilators and turret ventilators. An "ornamental" ridge ventilator shown by them has been apparently designed to represent externally a mimic construction of half-timbered work, but, as it appears to be wholly of metal, the taste displayed in it (at any rate with regard to the colouring) is not commendable. Less open to question, perhaps, is the way in which what is apparently a small cabinet hung upon or affixed to the wall of a room is made to conceal one of this firm's well-known wall-inlet ventilators. We say "perhaps," because, while some people will condemn the masking of a ventilator in this manner, there are others who will contend that it is justifiable to resort to such means in view of the prime importance of efficient ventilation. With care and judgment efficient ventilation is to be obtained without draughts, but such is the sensitiveness of some people that they feel, or fancy they feel, a draught whenever a ventilator is in sight,—and that whether the ventilator be open or closed. But, whatever form they may take, it appears to us that these wall-inlet ventilators, used in conjunction with the exhaust chimney-breast ventilators, are capable of keeping the air of even small rooms, where gas is burning, in a fairly cool and wholesome state.

At Stall 38, Messrs. Bowes, Scott, & Read, of London, exhibit Field's flush-tanks; and close by, at Stall 41, Messrs. John Knowles & Co., of Burton-on-Trent, have a good show of sanitary stoneware. One of the most noteworthy novelties in the Exhibition is shown at this stall, viz., Hassall's patent joint for drain-pipes. This, which promises to be very useful, and, in many instances, to obviate the necessity for using iron drain-pipes, certainly forms a very perfect and strong joint. To describe it in as few words as possible, in the absence of a section, it may be stated to consist essentially of a combination of Stanford's patent joint with the ordinary spigot and faucet joint, but with these important differences, viz., 1. The socket or lip at one end of the pipe is made much deeper than is the case with the ordinary pipe. 2. Through this lip or socket a transverse slit is made midway in the lip. This slit is kept uppermost when the pipes are fitted together. We shall, we think, be understood when we say that while spigot and faucet are fitted into each other in the usual way with the Stanford joint, there is, in Hassall's patent joint, what may be called a double Stanford joint, that is to say, instead of spigot and faucet each containing one girdle or band of the composition which goes to make Stanford's joint, there are here two bands of the Stanford composition inside the socket, and two girdles or belts of the same material round the spigot. These belts and bands of composition would of themselves suffice to secure a watertight joint, or even one of them (as is the case with Stanford's joint pure and simple), but being placed 1½ in. or 2 in. apart on both spigot and faucet, it will readily be understood that when the pipes are fitted together there is a space left midway in the depth of the socket all round the spigot end of the pipe, the said space being bounded by the bands of composition referred to. Now becomes apparent the utility of the slit before referred to, for it serves as an aperture for pouring in liquid Portland cement, which fills up the whole of the vacant space left inside the socket. To ensure that the space is completely filled, resort is had to the very simple expedient of forming a sort of mimic dam halfway across the slit, and pouring the liquid cement in at one side only, until it rises on the other side, thus ensuring the complete filling up of the annular space which we have described. If this description is quite clear, it will be obvious to the reader that the Stanford composition will have completely prevented the passage of any of the liquid cement into the interior of the drain-pipe itself, thus at once making a complete cement joint, and totally avoiding the risk of obstruction by the oozing of the cement into the interior of the waterway of the drain-pipe. We have described this invention at some length on account of its intrinsic importance.

At Stall 42 Mr. Roberts, of Haslemere, exhibits an improved form of his automatic "rain-water separator," which was described by us some months ago. At Stall 44 Messrs. Elliott, Edminson, & Olney, of Manchester, exhibit their double-cone mechanical lead-pipe joint, for which they claim that it is "a perfect substitute for the plumbers' wiped joint." We have seen something of the kind before, but this method of jointing is likely to be useful in many situations.

Mr. Ellison, of Leeds (Stall 46), exhibits his excellent "Radiator" ventilators, one of them with a screw movement worked by a key, so that only the holder of the key can open or close the apparatus. The same exhibitor also shows Stevens's exhaust ventilators. Stall 47 is occupied by Messrs. Leggott & Co., of Bradford, who show their admirable contrivances for opening and closing fanlights and skylights, thus affording easy means of control over ventilation in situations where the exercise of such control would be exceedingly difficult without the aid of such contrivances.

The Whitwick Colliery Co. (Stall 50) exhibit some good moulding and facing bricks and architectural terra-cotta. Messrs. Broad & Co. (of Paddington), Stall 51, show a good arrangement of drainage inspection chamber lined with white glazed bricks, the channels for the drains being white-enamelled. At the next stall the Bourtreehill Co. make a good display of glazed fireclay sinks and other sanitary goods; while at Stall 53 the Wortley

Fireclay Company show some white enamelled bricks. At the adjoining stall the Patent Porous Carbon Company exhibit their material in its applications to water supply and sewage purification; for the latter purpose we are informed that it has been in use for some time at Southampton, with satisfactory results.

Messrs. James Stiff & Sons, of Lambeth (Stand 57), exhibit some of their excellent traps and other specimens of sanitary stoneware. We notice that they have received awards at this exhibition for the Weaver's ventilating sewer-air trap, and for their architectural terra cotta. The "Kensington" grease-trap, also exhibited, was described and illustrated by us a few months ago (see p. 884 of our last volume). The Patent Victoria Stone Company (Stall 69) show their material for paving and steps; and, hard by, the Croft Granite Company show a kindred material, some of the "ornamental" adaptations of which, in the shape of cast portrait medallions and other sculptural subjects, are, to say the least, far from judicious. Stall 71 is occupied by Messrs. Nightingale & Co., of Great Grimsby, with some good specimens of wood-block flooring.

Among other exhibits which are worth attention, but which we can only here enumerate, is Dr. Paulson's method of ventilating the sewers by the aid of the street lamps (Stall 93); Barton's "hermetically closed" sectional sanitary van, for use in towns where the "pail system" is in vogue; the "Gordon" disconnecting trap (designed by Mr. Joseph Gordon, the Borough Surveyor of Leicester), exhibited by Messrs. Fergusson & Starkey; some manhole and inspection covers, and other appliances used in the Leicester drainage works, and made to the order of Mr. Gordon by Messrs. Wright Bros.; Bromhead's automatic dry gas regulator (Stall 94), The "Wenham" Gas Lamp (Stall 99); and Willacy's patent sand-spreading cart for use where slippery roadways exist.

We must not close these notes without mentioning that the Ladies' Sanitary Association have a stall in the Gallery for their excellent publications, which should be disseminated far and wide.

The Exhibition will remain open until Saturday evening, October 10th.

NOTES.

THE correspondence which has been recently going on in the *Times* between a writer signing himself "Sanitary," and persons who were officially or personally concerned about certain dilapidated houses in Marylebone, received a fresh comment in a letter from a member of the Metropolitan Board of Works on Tuesday, who admits that the strictures of "Sanitary" are not a whit too severe if they can be substantiated, but inquires whether he has ever brought the matter under the notice of the Board in the proper manner, by a complaint, in writing, addressed to the Clerk of the Board. "Sanitary" replies on Thursday that of course the matter has been known all along to the officials of the Board of Works, but does not distinctly say that he applied in form, which was obviously the first course to take. It is very probable that the facts are as stated, and that the object of the writer is good; but he would have done better to have set about his efforts in the official channel first; and, in consideration of the nature and manner of his charges, he would have done better to sign his name to his letters. Neither has the member of the Board of Works, who is affirmed to be the ground landlord of the houses, unveiled himself. But there appears to be an awakening in the minds of the Board in regard to the ownership of insanitary property. A few days since we read of a complaint made by the Mansion House Committee, under the Artisans' Dwellings Act, to the authorities of Homerton, in regard to three houses, in this case also the property of a Member of the District Board of Works and of the Board of Guardians, which were in a state unfit for human habitation, according to the report of Dr. Tripe, the Medical Officer. The owner of the houses, who was present, admitted the bad condition of the houses, but said they would be pulled down at Christmas, and "Was it worth while to put him to an expense of 200*l.* for repairs?" He does not seem to have explained how they came to be in that condition, or how long they had been so. Mr. Runtz, of the Board of Works, said it was a "great misfortune" that a Member of the Board should hold property which was unfit for people to live in. It is certainly a great misfortune for the people who have to live in them, and the sooner members of the Board surmount this kind of "misfortune" the better for all concerned.

IN regard to Mr. Baker's comments on the weakness of many railway bridges, to which we referred in our last, Mr. Ewing Matheson suggests that many portions of such structures, besides losing their elasticity by oft-repeated bendings, are at the same time wasting by rust. "The fact," he says, "is apparently not sufficiently appreciated that iron and steel structures must either be protected entirely from the atmosphere by being embedded in concrete or masonry, or must be regularly and effectually painted. Too often painting is neglected, or, when nominally attended to, many of the connexions and other important parts are inaccessible to the painter's brush." Between Mr. Baker's and Mr. Matheson's vaticinations, there is a pleasant look-out for railway passengers crossing iron bridges.

FROM the *Bullettino* of the German Archæological Institute at Rome we learn that an interesting discovery has been recently made at Palestrina. Beneath the foundations of the cathedral a slab has been found, bearing (according to the accredited restoration) the following inscription:—"L. Quinctius T. f. L. n. praitor Le (VCADO.CEPIT | T. Quinctius. T. f. L. n. cons | V DEDIT. Great interest attaches to the stone because it is one of the earliest remains of Latin epigraphy we possess; it belongs to the sixth century A.U.C. Mr. Stevenson, who restores the inscription, thinks we have here a votive stone recording the dedication of booty taken from the town and island of Leucadia, in the province of Acarnania, by L. Quinctius Flaminius, in the year A.U.C. 567. If so it is, of course, valuable monumental evidence to a historical fact hitherto accredited only by literary tradition.

THE Berlin Museum has recently been enriched by the addition of a very fine bronze, bought at the Gréau sale in Paris. The statue represents a standing Apollo of the athlete type. However much other museums may covet the possession of so fine a piece of work, archæologists may be glad that the Gréau Apollo has gone to Berlin. It will there stand side by side with the beautiful Sabouroff bronze, to which we last year called attention. The two, which rank among the finest bronzes left us by the ancient world, present very marked analogies in style.

THE great dockworks at Tilbury, for which the first turf was cut in July, 1882, and the progress of which we have noted from time to time, are now fast approaching completion. The principal work that remains to be done is the excavation of the entrance from the river to the tidal basin giving access to the docks, which is of course necessarily the last part of the operations. This basin will be accessible at all states of the tide to large vessels, the entrance having a low-water depth of 26 ft., and 46 ft. at high spring-tide. This basin gives access to the graving docks, and a lock for passage and for controlling the water-levels to the main dock, the three being arranged in parallel lines between the tidal basin and the main dock. From the inner side of the main dock three long branch docks extend in parallel lines further inland, affording quay accommodation for more than thirty ships of the largest class. Between and on either side of the branch docks are the quays and sheds. Sixty hydraulic travelling cranes will be fitted for loading and unloading. The graving docks are closed by floating caissons, which are raised by pumping and towed out of position for the entry of ships. The lock is closed by immense iron folding-gates at each end, which are now being built up nearly in position, and will be moved into position on rollers when complete. The dock walls are faced with brick; the backing is a mass of concrete 6 ft. or 8 ft. wide at the top, and increased by steps to a thickness of about 20 ft. at the base. The concrete walls are honeycombed with sluices for the control of the water. The graving docks are emptied by a series of centrifugal pumps worked by steam. Hydraulic power for the whole working of the cranes, lock-gates, &c., is supplied from the engine-house on the north-west or land side of the branch docks, with two auxiliary accumulators in towers adjoining the graving docks. Near the entrance of the tidal basin the large hotel for the accommodation of passengers is now complete in all but its internal fittings, and will be a first-class erection of the kind. It is built on piles driven down to the gravel, and timber is largely used in its construction for the sake of lightness. A fine view of the whole extent of the docks is obtained from the roof of the hotel, the upper windows of which on the river side command also a fine prospect far down the Thames. Area is provided for an extension of the docks towards the south-west, to double their present acreage, with another access higher up the river. It is a great piece of work and carried out in the most thorough and admirable manner, under the direction of Mr. Manning, the engineer for the whole. The present contractors are Messrs. Lucas & Aird.

ANOTHER proposal has just been added to the numerous undertakings of harbours and docks that are so characteristic of the present day, viz., to transform the decayed town of Sandwich into a busy deep-sea port. It would not be quite correct to call it a new work, for it is in reality only reverting to the old order of things, when Sandwich was one of the most important, not only of South-coast, but of English ports generally, exceeding Liverpool in its volume of trade, and contributing a large contingent of ships to the navy in Henry VIII.'s time. So great was the coming and going at that period, that the night was as noisy as the day, and what with the embarkation and landings of royal personages and other visitors of distinction, Sandwich was one of the gayest places in the country. But the forces of Nature overpowered those of fashion, and the sea retired so persistently, that the whilom harbour was left high and dry inland,—its glory soon departed, and the streets became grass-grown for want of traffic. Even now, however, few more interesting towns are to be found in England, its churches and old houses affording a rich harvest to the antiquary; while those who are curious in folklore will find many singular names, both of streets and residences. The proposal now under discussion is to restore the business vitality of Sandwich, by forming a deep-sea harbour near the mouth of the Stour, and carrying it for two miles or so into the heart of the town, so as to bring it into communication with the South-Eastern Railway system. The nature of the soil is sand and very light gravel, which will reduce the cost of excavation to a minimum, as well as the time required for completion. Sandwich is a great deal nearer to Flushing than is Queenborough, or to Ostend than Dover, so that the promoters hope to make it a departure station for the Continent. Opening, as the harbour would do, directly upon the Downs, it would secure a safe entry in all weathers, together with a certain amount of business from the proximity of the vessels that are at anchor there. Moreover, the local industries of fish catching and curing, with the import of coal, will probably assume large dimensions. On the whole, the industrial outlook of Sandwich seems very satisfactory, and we may again expect to see ships moored almost under the walls of the ancient castle of Richborough,

where once upon a time the Roman triremes disembarked the legions of Cæsar.

THE announcement which appeared in Wednesday's papers regarding railway freightage on the American trunk lines shows that, with all their advantages, the freighters of that favoured region have some unpleasant things to put up with. The low rates which have been in force have apparently proved unremunerative, an advance of 50 per cent. having been agreed upon for westward traffic, leaving the rates for that bound eastward still under consideration,—probably on account of the uncertain effect upon exports which might be produced by a similar sweeping alteration. The effect of this great advance upon the already fluctuating prices of American Railway Stock remains to be seen. Under the old rates —low as they were,—the charges by rail were some four times as much as those by the great Lake steamers, which are fast becoming powerful rivals to the railways. Those lines which have this competition to cope with have gone down considerably within the last few years, having lost much of their grain and cattle traffic. It appears probable that they reduced their freights to a losing figure, and have now to adopt a retrograde policy in order to secure dividends. But to the freighter who does not enjoy the advantage of alternative methods of transit, an advance of this nature must be a very serious matter. The alteration in the mode of charging carriage on traffic conveyed at "Owners' Risk," which came into operation on our own lines some three years ago, and which represented an increase of 10 to 15 per cent. to those traders using that system of conveyance, was most strongly resented ; but it seems that our Transatlantic cousins are by no means free from railway-rate grievances, both traders and speculators being subjected to sudden and heavy changes through fluctuating freight rates such as we seldom experience.

IN reference to the subject of the pollution of the Lea, we have had forwarded to us the result of an analysis of effluent water, with a report upon the treatment of sewage carried on at the Leyton Sewage Works, which are under the superintendence of Mr. W. Dawson, C.E., Surveyor to the Board ; it bears date Sept. 12, and is signed by Mr. W. C. Young, F.C.S., Consulting Chemist to the Lea Conservancy Board. He says the result of his analysis of the sample of effluent water is that it "is practically free from odour, entirely free from micro-organisms, contains very little organic matter of any kind, shows no liability to undergo putrefactive change, and is exceedingly satisfactory in every respect." He also says the use of "black ash" or "alkali waste" for the treatment of sewage, if it is properly applied at the sewage works, is the most satisfactory mode of dealing with sewage at present known, where chemical precipitation has to be relied upon solely for purification It destroys the offensive gases present, and prevents the subsequent putrefaction of the organic matter in solution, its effect being permanent and not merely temporary, as is the case with most chemical precipitation processes. In Mr. Young's opinion the use of black ash waste with lime employed at Leyton "forms a combination capable of giving the most satisfactory results at present attainable." We give this, of course, "without prejudice" (as the lawyers say), merely as one statement in regard to a matter of public interest.

THE eighty-first volume of the Proceedings of the Institution of Civil Engineers, just issued, is a book of remarkable value. It contains two papers on the Metropolitan and Metropolitan District Railways, by Mr. Baker and Mr. Barry, illustrated by five plates, which supply a much-felt want by placing on record the history and the main details of these important and original undertakings. At a moment when steam tramways and ordinary omnibuses are running costly railways so hard, this account has a very opportune value ; and it is especially worthy of note that in 1854 it was expected that the trip from Paddington to the City would be accomplished in fifteen minutes. Mr. Stroudley's paper on the Construction of Locomotive Engines is illustrated by four plates, giving drawings of the standard locomotive engines on the London and Brighton Railways, on the large scale of 3-8ths inch to a foot. It is to be hoped that the authors of these valuable contributions to engineering knowledge will think it due to their own fair fame to publish standard editions of their work, enriched with the upshot of the discussions, and of a size to give the admirable illustrations without folding. The papers on the Purification of Water by Iron have a special value, in view of some of the remarkable discoveries recently made as to the rapid disinfection of sewage by a novel application of this powerful agent. The papers on the Cape Government Railways, by Mr. Brounger ; on the Public Works of the Orange Free State, and on the Flow of the River Buffalo, have also much public interest at a time when the reports and surveys of General Sir Charles Warren's expedition are being anxiously expected. In one point only has the indefatigable and able editor of the Minutes been unfortunate. The portrait of Mr. Charles Manby is a grievous smudge, altogether unworthy of the beauty of the typography and lithography, which, as usual, are marked features of this series of valuable records of scientific experience and progress.

IN the Evening Class Department of King's College there are a series of lectures announced, to commence on October 5th, on "The Properties of Metals and Alloys, and their Uses in the Arts," and another course on "Fuel," the lectures being included under the general head of "Metallurgy." The Professor in Metallurgy is Mr. A. K. Huntington, who we presume is the lecturer on metals, though this is not explicitly stated in the syllabus ; and the Demonstrator is Mr. W. G. Macmillan, who delivers the series of lectures on fuel. A class of Practical Metallurgy is also to be held on Friday evenings, going into the general methods of assaying and mechanical testing. The laboratories include two testing-machine, one on Mr. Kirkaldy's principle, the other a Thurston automatic recording machine. Free admissions to the classes are given under special circumstances, to be ascertained on application.

IN a general way we have no great sympathy with the writer who signs herself "Ouida," but her long letter in the *Times* of the 22nd on the subject of the de-poetising of Venice is one which it is impossible to read without a melancholy interest. The moving cause of the letter having been written seems to have been a commiseration for the poor gondolier, who, according to "Ouida," is likely soon to have no work to do, if the canals are given up to the usurpation of steam traffic. This, unfortunately, is, to begin with, a piece of characteristically feminine logic, or want of logic. We are no more called upon to make work for the gondolier, to keep him in being, than we were called upon to keep up stage-coaches for the sake of the drivers and of the coaching inns. They had their day, and had to go when a more commodious and rapid means of transit was invented. But one cannot help feeling that Venice is "an exceptional case." It stands alone in the world in regard to its site, its architecture, and its associations and history ; and it does seem lamentable that we cannot preserve some of the unique character of such a place from being destroyed by the all-levelling spirit of modern trade and its servant steam. This feeling, however, it must be admitted, is that of persons who do not live in Venice, but who visit it as a form of enjoyment. They are in the vast majority ; but it is easy to understand that to a tradesman born in Venice, and therefore probably not seeing anything unique or remarkable in a place to which he has always been used, it would seem unreasonable that he is not to start a steam-launch or a factory if he can make a better living thereby. "Ouida" suggests one excuse for exceptional legislation in respect of the steamboats, in the danger to the foundations caused by the continual wash from the steamers ; and this is probably a real and tangible objection, which might serve as a legitimate excuse for the restriction of steam traffic by special taxation or otherwise. "Ouida" complains, also with reason, that nothing but iron, "that most hideous of all materials," can be found when a new bridge is wanted in Italy, and that such structures, "painted lead-colour above and red underneath," look worse than anywhere else, in comparison with the exquisite ancient bridges of Venice. In regard to the treatment of the ancient buildings, again, she asks, "Is it fitting that a palace of historic fame should have spread over its front gigantic letters, declaring that some one sells glass or *bric-à-brac* in it?" Here is, certainly, a Vandalism, in regard to which local legislation might have something to say ; but, we fear, local authorities care little about the matter. Perhaps if it occurred to them that they were destroying the very interest which brings the stranger to their city, they would bestir themselves to arrest this modern spoliation of the "Sea Cybele."

THE ARCHITECTURAL ASSOCIATION.

VISIT TO TAPLOW COURT AND CLIEFDEN.

THE sixth Saturday afternoon visit of the Architectural Association was made on Saturday, the 19th inst., to Taplow Court and Cliefden. The excursion was under the guidance of Mr. James Rutland, of Taplow, the first visit being made to his house "The Gables," when some interesting photographs of the various objects of interest found in the mound in the churchyard at Taplow last year were examined, and other curiosities. The party then proceeded to Taplow Court, the seat of Mr. Grenfell. The earlier portions of the house were built from the designs of Cottingham. The house did not present any objects of interest from an architectural point of view, but the grounds and views from the principal rooms were very fine. The old churchyard of Taplow adjoins the house, and the curious mound in which were found the remains, the photographs of which had just been examined, is situated in the centre of the ground. Mr. Rutland informed the members that the churchyard was the centre of a large Danish camp, and that the ground was full of flint implements, showing that it had been occupied as a camp for a long period.

The next place visited was Cliefden, the property of the Duke of Westminster. This place, famous for its sylvan scenery and unrivalled views of the Thames, does not possess so much interest for the architect, apart from the splendid site. The present house was built from the designs of Sir Charles Barry, about the year 1851, the former house having been twice burned, in 1795 and 1849. Only a small portion of the old house, built at the end of the seventeenth century, remains. It was a red brick building, with stone quoins of the usual type of that period. The design by Sir Charles Barry is said to be a revival of Inigo Jones's design of old Somerset House, and is carried out in stucco. The main entrance is on the north, and has a wing on each side, connected by curved corridors; on the left are the greenhouses, &c., and on the right the stables. These have been enlarged, and a water-tower and clock added, from designs by Mr. Henry Clutton, in 1861. The south front, which is the one seen from the river, stands on the original terrace, which is 433 ft. long, the lawn being reached by means of a double flight of stairs in the centre. The terrace contains various rooms, which are also connected with the basement of the house. The lawn, of five acres, is laid out in the formal style of landscape-gardening, and is beautifully kept. The entrance-hall contains a very fine tesselated pavement presented by Mr. Herbert Minton to the Duchess of Sutherland; there is also an interesting frieze round the staircase from Minton's works. The hall contains some interesting pieces of sculpture. The dining-room ceiling panels have trellis work painted on them, with clusters of fruit, and the open sky painted as background. The staircase ceiling is painted with the Four Seasons, portraits of various members of the family being introduced.

Mr. Rutland read an interesting history of the manor of Cliefden and the various owners of the property. The original house was built by the second Duke of Buckingham, whose miserable death has been commemorated in

Pope's well-known lines. About the year 1700 it was purchased by George, first Earl of Orkney (a favourite and celebrated commander under John, Duke of Marlborough). He built the pavilion in the grounds to commemorate his victories in the Low Countries. During the infancy of George III. his father, Frederick, Prince of Wales, lived here for many years, renting it of the Countess of Orkney. On the 20th of May, 1795, the house was destroyed by fire, occasioned through the carelessness of a maidservant; it lay in ruins for twenty-five years, when, in 1830, it was purchased by Sir George Warrener, who rebuilt it. The estate was sold in 1849 to the Duke of Sutherland, and during some alterations was again burned down. The present house was built by the late Duke of Sutherland. On the west side of the lawn is a temple, with octagonal cupola, built from the designs of Leoni in 1735.

The Yewtree-walk, leading down to the river and the celebrated springs, is 858 ft. long. The estate of Cliefden consists of about 436 acres. The house and grounds occupy about 136 acres. The woods abound with primeval yews. In the cliffs are several small caves or fissures, which may have been once inhabited. Tradition says that they were the homes of robbers, and that in one of them Princess Elizabeth took refuge from her sister Mary. Mr. Rutland mentioned that the Duke of Westminster had given him permission to explore these caves, and there could be no doubt of their having at one time been inhabited at a very remote period by a flint-using people. He had found flakes and scrapers of flint, rude pottery, and a bead and a silver penny of Egbert's, which was found in making a road in the woods.

The meadow opposite Cliefden is called Battle Mead, probably from a Saxon or Danish conflict, and during the Civil Wars, when Cromwell was at Windsor with 22,000 men, in 1645, billeted in the villages round, skirmishes must have occurred, as stone cannon balls have been found in the woods.

MANCHESTER AUTUMN EXHIBITION.

THE Autumn Exhibition now open at the Art-Gallery of the Corporation of Manchester (the third held under the present management, it appears by the catalogue, which comprises 1,166 works of art), is one of considerable interest; for, apart from the ordinary contributions of artists who have sent their works direct, there is a special selection of pictures by Sir John Millais, R.A., which have been lent to the Gallery by their various owners.

These pictures extend, as to date, over many years, and may be said to illustrate the career of the artist during a quarter of a century of incessant labour in his profession.

This loan collection includes "Portrait of the Marquis of Salisbury," "Mistletoe Gatherers," "The Princess Elizabeth in Prison at St. James's," "The Princes in the Tower," "Portrait of Mr. Gladstone" (the three-quarter length in standing attitude, which we have already noticed, when exhibited at the Grosvenor Gallery this summer), "Message from the Sea," "Autumn Leaves," "Caller Herrin," a beautiful child's face, "Cherry Ripe," "Cinderella," "Lorenzo and Isabella," "Dropped from the Nest," "Awake," "Asleep," "The Appointment," "The Sick Child," "Amine and the Lady," "Jacobite Cockade," "Portrait of J. Bright, M.P.," and some studies in chalk, and pen-and-ink drawings. It is impossible, on examining these pictures, not to be struck with the much freer and less conventional treatment observable in the more recent, as compared with the earlier, works of the artist.

Passing from this loan collection to those pictures which form the more immediate staple of the Exhibition, we find a large number of figure-paintings of importance, including many which have already been noticed in our articles upon the London galleries. Among these are "Phœbe" (139), Sir F. Leighton, P.R.A.; "The Sheepfold" (64), J. R. Herbert, R.A.; "Portrait of Mrs. F. Myers" (140), G. J. Watts, R.A.; "A Norman Archipelago," J. Brett, A.R.A.; "The Holy Child," G. Goodall, R.A.; "Portrait of Robert Browning" (327), by R. B. Browning; "Venetians" (387), S. Luke Fildes, A.R.A.; "Portrait of the late Lord Overstone," Frank Holl, R.A.; "Diadumene" (426), T. Poynter, R.A.; "Pandora" (464), Walter Crane; "Queen of the Night," H. Moore, A.R.A.; "Circe," John Collier, &c.

Of the above, Mr. Fildes's fine picture, "Venetians," and Mr. J. Brett's characteristic and highly-finished work of the coast of Sark, which he calls "A Norman Archipelago," have been bought for the Manchester Permanent Gallery, and we think our Manchester friends have used a wise discretion in thus boldly securing works of a high order, instead of (as we sometimes see done), selecting inferior pictures, rather apparently for the sake of some sentiment they are supposed to convey, than for any intrinsic merit of their own.

Mr. John Pettie, R.A., has "Here's to the Maiden of bashful Fifteen," which represents a Cavalier, in the white satin attire this artist is so fond of, with glass in hand proposing the health. It is a bright effective little picture, but the figure is not equal to some in the same vein we have seen of his.

"Showing his Paces" (822), W. F. Calderon, is remarkable for the spirit and motion of the horse coming forward at a sharp trot, held by a lad, who evidently has all he can do to hold and keep up with his charger. The attitude of both horse and youth are admirable.

"The Angler's Rest" (446), Mr. H. S. Marks, R.A., is one of this artist's pleasant delineations of human and rural nature. Two anglers, in sixteenth-century costume, discussing their day's sport, and refreshing themselves in front of a country inn, overlooking a nice bit of English landscape. This picture, if we remember rightly, has been exhibited in London.

"The Poet's Dream," by John Faed, R.S.A. (151), is an imaginative and clever picture. The figure of the poet lying asleep in the foreground is well drawn, but his dreams of ancient palaces, heroes, heroines, &c., represented in the sky, are somewhat realistic and wanting in atmosphere, and the aërial mystery, which they ought to possess to appeal to the mind as visions.

"Evening," B. W. Leader, A.R.A., is a very good specimen of the painter on a small scale, possessing more sentiment and poetic effect than is always met with in his pictures. His fine landscape, "Hedgerow Elms and Hillocks Green," which was exhibited at the Royal Academy, is also here.

The "Slopes of Ben Nevis" (265), C. E. Johnson, is a large landscape possessing considerable power, and portraying a very picturesque subject; but the catching lights on the side of the mountain strike us as too uniform in tone and strength, which has the effect of detracting from its size, those about the summit being nearly as strong as those nearer the eye.

Mr. Edwin Ellis exhibits a coast scene, "The Haven under the Hill" (128). This picture has every appearance of being a study from nature. It is of a brown headland and small bay, with fishermen in the foreground landing a boat-load of fish. It is a picture that takes one in fancy to the fresh sea-side. It has been selected for the Manchester Permanent Gallery.

There are two good sea-pieces by Edwin Hayes, R.H.A., "Fair Winds from the Harbour" (175) and "Shifted Cargo," which latter was in the Royal Academy Exhibition. This artist generally gives us a grey flowing sea, liquid, and in motion, while as a draughtsman he is almost always correct in all the details of his shipping. The masts and rigging of the disabled ship in the latter picture are examples of this, for while he represents them "weather worn and tempest torn," their details are not scamped, and it is evident he is familiar with the aspect of things he is seeking to represent.

Besides his Grosvenor picture of "Queen of the Night," Mr. H. Moore, A.R.A., has "A Marine View" (575). Here we have a great expanse of grey sea, with a good sky, and one small schooner, the drawing of which is not good; nor is this the only instance which may be pointed out of otherwise fine sea-pieces being marred by similar carelessness, it can hardly be ignorance, on the artist's part. To any one acquainted with the details of shipping these shortcomings are great eyesores.

"The Old Falcon, Gravesend," by Mr. C. E. Holloway (687). This is an effective and interesting water-colour drawing of one of those picturesque and irregular old buildings, partly of brick and partly of wood, which one used often to meet with in out-of-the-way places on the Thames and other rivers, where sailors were fond of sitting overlooking the water, and, pipe in mouth, would "fight their battles o'er again." The march of civilisation is fast demolishing such little nooks and corners, and replacing them with buildings no doubt much more in accordance with the principles of sanitary science, but lacking their picturesqueness and associations: the pencil of the artist is well employed in preserving their memory.

Even in our short notice No. 941, "Pygmalion and Galatea," by Mr. H. T. Schäfer, ought not to be passed over. The statue of Galatea is springing into life, the flesh tint diffusing her face, and the hair showing colour, not auburn, but light golden; Pygmalion kneels with his hands before his face at the statue's feet. The execution of this picture is very refined and the finish high without being overdone; the face of Galatea is, perhaps, wanting in loftiness of expression, but it is very pretty and there is a classical feeling throughout the picture.

"Rue de la Mer Rouge, Algiers" (678), Mr. R. Tabley Kelly, is a clever architectural drawing with clear lights and shadows.

"Coming from the Fountain" (698), Mr. T. R. Macquoid, is also an architectural subject, an Italian gateway well treated with figure.

"Rouen Cathedral" (1,003), M. Jules Lessore, is a careful drawing, but rather woolly in texture, probably from over-sponging.

The "Interior of Dining-room, West Kirby, Cheshire," (1,017), Mr. Berenger Benger, is a well-executed drawing of carved chimneypiece and interior of room.

There is a light and sparkling little drawing by Signor Giuseppe da Pozzo (1,023) of a Venetian canal. Also some interesting sketches in black and white by Mr. Hedley Fitton, called "Hawarden Sketches," including a view of the church.

"Central Board Schools," Mr. Henry Lord (1,057), is a design in brick with stone dressings, of five stories in height, with four gablets to front of street.

"Nixon School, Oxford" (1,079), Mr. R. P. Spiers, is a drawing of a curious old Gothic building, but filled in with insertions of details of Queen Anne and other dates from time to time.

We cannot afford space for further remarks, and must leave unmentioned very many drawings of merit (there is no sculpture exhibited), which go to make up a most enjoyable and interesting provincial exhibition.

NOTES IN SPAIN.

SAN ILDEFONSO, OR LA GRANJA.

OUR illustration (principal entrance to the royal seat) represents the first view of the palace on entering the grounds. The three domed towers surmounting the *Colegiata* here show to advantage, whereas many glaring defects seen on a nearer view do not catch the eye at this distance. The pinewoods, covering the first conical hill to the right, and extending many leagues on every side, and the more rugged and precipitous mountains beyond, form an admirable background to San Ildefonso, and constitute, indeed, its chief charm.

The *Colegiata* forms the centrepiece of the whole group of buildings on this, the north-west front, the royal apartments extending on either side and behind, and having their grand façade towards the gardens and the south-east. Appurtenances to the palace, such as cavalry barracks and the royal stables, flank the approach, and in front of these appears a double line of chestnuts adorning the view and affording grateful shade. Higher up, what was formerly a splendid open square, used for grand reviews, has become in modern times a beautiful *glorieta*, or garden with lawns, lovely pines, shrubs, and flowers.

There is a profusion of beautiful fountains, artistically arranged in various portions of the grounds of the palace. One series, arranged in terraces, is called the Racecourse (*La Carrera de Caballos*); the fountains consisting partly of figures of horses with water spouting from their nostrils, &c.; the whole in a somewhat vulgar taste; but the effect of the waters playing to a considerable height, dispersing themselves in a feathery spray, once more to fall gracefully over the sculptured forms beneath, and all this, amid the leafy limes on either hand, is indeed admirable. The mountain background, with the deep gullies clothed with sombre green pines, descending abruptly from the lofty crests above, forms a magnificent setting for these works of art, as they may be called, notwithstanding their defects in taste and execution.

The origin of the name and royal seat of San

Ildefonso is not without interest. The kings of Castile possessed an immemorial right of chase in the pine forest of Valsain (Val de Sapins), and were accustomed to pass some weeks occasionally in the Palacio del Bosque, situated in the village of Valsain, about half a league to the south of San Ildefonso. King Henry IV. was residing there in the year 1450, and either on account of his deliverance from the claws of a wild beast on the spot, or simply out of devotion to the saint, resolved to erect a dwelling-house and hermitage to San Ildefonso, on the site now within the royal grounds and known as the Hermitage.

In 1477 the Catholic sovereigns, Ferdinand and Isabella, being in Medina del Campo, executed a deed of gift of the residence of San Ildefonso to the monks of the Segovian monastery, El Parral, of the order of San Jerome. This was followed next year by the cession to the same order of the Hermitage, which in the mean time had passed to the see of Segovia. About half a century later, judging, at least, from the appearance of a cloister still existing enclosed within the actual palace, the monks erected a *casa hospedería*, or country-house, with quarters sufficient for the accommodation of guests, of simple and severe style. Herein during some 200 years, they and their successors passed the hot season, devoting their time, says the record, "to the contemplation of the beauties of nature, and the meditation of heavenly things." To this monastic country-house and *Grange*, we trace the origin of the name and town of La Granja, its other designation having been already accounted for.

In the year 1720, Philip V., first prince of the House of Bourbon, occupied, after a hard-fought war of succession, the throne of Spain, and he, too, in his turn, came to hunt in the forest of Valsain. It seems that he was so taken with the charms of San Ildefonso that he, assisted by his courtiers, put hastily together a log hut, wherein they passed the night. Approving on trial of the site, he made overtures to the monks of St. Jerome for the purchase of their country-house, hermitage, and possessions, all which passed into the hands of the king, on payment annually of 1,000 ducats and 100 bushels of salt from Atienza. The king's fixed idea of abdication in favour of his son, Louis I., an idea he carried into effect in 1724, though revoked during the same year in consequence of that son's death, seems to have been one chief object for the selection of this picturesque site. He wished, in the words of Spanish authors, to create another Escorial, but created instead another Versailles. The first purchase of lands being too moderate for the magnificent designs of Philip, it was followed by others in 1723 and 1735.

The design of the palace and its collegiate church was entrusted to Don Teodoro Ardemans, "Maestro mayor del Real Palacio," and the works were begun on April 1st, 1721, the sculptures and laying-out of the gardens being commenced by Carlier and Boutelou at the same time. During the year 1723 we read that the works were carried on with great spirit under the direction of Philip and his queen, Isabel de Farnesio, who both came to inspect them every day from Valsain. The palace was blessed on July 27th, 1723, and occupied during that summer, the church being likewise consecrated on December 22nd of the same year by Cardinal Borja, Patriarch of the Indies. But the laying-out of the gardens involved an immense amount of time and labour, due to filling up ravines, levelling the inequalities of the surface, constructing the numerous fountains, reservoirs, and conduits, so that some twenty years were necessary to bring all to a conclusion. The country-house of the monks of the Parral was not destroyed, but enclosed within the new palace by the king's express orders. In fact, the court, cloisters, and two towers, of much the same style and date, occupy a post of honour in the very centre of the plan.

The ground-plan of the original palace is a parallelogram with its front to the gardens on the south-east. The *Colegiata* is an excrescence, so to speak, from the right line of the opposite side. It lies in the same line with and directly behind the sixteenth-century cloister and central portion of the chief façade just mentioned.

The front of the palace, more than 500 ft. in length, with a central façade of over 200 ft., and of corresponding height, is truly regal in its magnificence. The finest view of the façade is from a platform in front of the Fountain of the Three Graces, directly in the line of the Grand Cascade, and within sight of the Throne Room. The effect of the Classic colonnade in the centre, and of the surmounting attic, seen from this point, is decidedly favourable. Four columns occupy the very centre of the middle portion, or chief façade, which projects slightly out of the general line of the garden front of the palace. Above the entablature rises the attic, adorned with the shields and medallions of the founders, represented as Roman warriors. The cornice of the attic is supported by caryatides, typifying the four seasons. Surmounting the cornice is a balustrade adorned with trophies. Behind this balustrade arise the cupola and lantern of the *Colegiata*.* Three kinds of material are used,—grey granite in the walls, plinths, and parts of the entablature; a delicately-coloured red stone, resembling travertine, from Sepulveda, for the pilasters, columns, and frieze; and white marble for capitals and pedestals. From the point of view we have chosen only the chief façade, already described as some 200 ft. long, is visible, the view of the two wings being intercepted by the shady lindens on each side. Was this intentional on the part of the designers of palace and gardens? This disposition has been condemned as contrary to all rules of laying down gardens by the two intelligent authors of an excellent Guide to San Ildefonso, published in the present year, members of the Corps of Engineers and of the Royal Household. It is possible, however, that this disposition of the foliage was intentional; for otherwise the entire façade of 500 ft. would have seemed very low in proportion. The architect of the façade was an Italian, by name the Abate Juvara, and his plan was adopted and carried out by his pupil Saqueti.

We have mentioned the fact that the old monastic country-house was enclosed within the new palace. These remains can be best seen from the Patio de la Fuente. In the centre stands the fountain which gives name to this court. It has the form of a pillar, with sixteenth-century mouldings, and a jet of water issues from each face into a basin forming a Maltese cross beneath. The building is of three stages, and there are two square towers at the angles, surmounted each by a balustrade. The cloister consists of a Classic colonnade of very plain and severe forms, and the shafts of the columns are of a single block of granite.

Returning to the view of the entrance in the first illustration, it may be mentioned that the long lines of barracks and stables on either hand, the upper portions of which are seen in the view, as well as the loftier appurtenances in the Plaza beyond, were erected by Charles III. (A.D. 1759–1788), about half a century later than the original Palace. It has been already noticed that the view of the palace and its collegiate church, from the entrance gates, with its background of pine forest and mountain, is, notwithstanding that mixed character, for which the eighteenth century is in so many instances chargeable,—taken all in all, picturesque and pleasing.

A fine open esplanade, with statues for the most part of no especial merit, leads from the palace to the several showy *parterres* and shady avenues with which the park abounds. The grand cascade, arranged in terraces of marble, with the several fountains, and a handsome pavilion, with sculptures, pillars, and pediments, wrought in rich red stone, and all included in this front view, is one of the finest features of the beautiful gardens. It is no wonder that the founder took a lively interest in this special view, and urged on the works to the utmost. Between the esplanade and the cascade is an effective *parterre*, kept in excellent order. On each side are lines of statues and vases, the former of marble and by no means devoid of merit, the whole view enclosed on either hand by tall and shady limes.

The Collegiate Church, of which the tall towers and dome give so much character to the approach to San Ildefonso, is not otherwise very remarkable. The plan is a Latin Cross, the dome rising from the intersection of the arms. The high altar is entirely of marble and porphyry. The tabernacle is of lapis-lazuli, inlaid with marble, and shows in its front a mosaic of Our Lady of Loretto. The retable is supported by Corinthian pillars of red marble, resembling jasper, the mouldings of the bases and the capitals being of gilt bronze. The altar-piece itself is a large oil-painting of the Blessed Trinity; the patron saints of the founder and his family are seen in an attitude of adoration beneath the leading figures. It is put down to Solimena, of the Neapolitan School, and an imitator of Luca Giordano. Opposite to the high altar, though separated from it by the body of the church, as usual in Spain from the sixteenth century, the canons, attired in their purple robes, of like style and colour to those worn by the canons and prebends of St. Peter's in Rome, sing the offices of the Church in choir-stalls, ably carved in the Renaissance style. The principal Royal tribune is supported above the choir by two marble pillars, once forming part of the collection of Cristina, Queen of Sweden. There are other tribunes for the rest of the Royal family, overlooking the aisles on each side. In a chapel near the high altar is the mausoleum of the founder and his queen, Isabel Farnesio, with this inscription:—

PHILIPPO V. HISPANIARUM REGI,
PRINCIPI MAXIMO, OPTIMO PARENTI,
FERDINANDUS VI. POSUIT.

Though the material is magnificent, and the execution of statues and reliefs not devoid of merit, the taste and predominating ideas which produced the design of this monument cannot be commended.

Among the many interesting and valuable objects preserved in the sacristy, we need only mention two.

First, there is a monstrance of the last century measuring 3 ft. high, containing 2,014 emeralds, diamonds, and topazes. Its weight is 26 lb., and its estimated value 25,000 dollars. The higher portion is wholly of gold, dividing outside the circle into rays and crosses. In the stem is a small figure of the Immaculate Conception, of solid enamelled gold. The whole is surmounted by the cross. The effect produced by the display of gold and of so many jewels is simply magnificent. The many fine emeralds and the innumerable diamonds give this *custodia* a character of special beauty.

Secondly, there is a Processional Cross of the style of the fourteenth century, proceeding from the ancient parish church of Santa Columbia in Segovia. It is of silver gilt, very richly and delicately wrought in filigree into Gothic forms. The ball-flower finials terminating the arms of the cross and other details point out the above century as the probable date. The geometric tracery imitated contains round forms as well as pointed, and the oak-leaf prevails likewise. In a sort of boss in the lower part of the stem the ornamentation takes the form of a series of turrets, frequently repeated,—a form of Gothic decoration frequently found in Mediæval stained glass, of Continental origin. The Crucifixion is represented by a figure of very pure and brilliant silver, and, date considered, is of excellent design and execution.

Of the interior of the palace, of its adornment and works of art, we can say little here, for, although we visited it twice, on neither occasion was there an opportunity for studying it in detail. Though fitted up in much the same style as other royal palaces in this country, nevertheless it appeared to us hardly equal to some others in the country, especially that of Aranjuez. It once possessed, it is true, valuable collections of paintings, statues, and marbles; but the most precious of these were sent by Ferdinand VII. to enrich the museums of Madrid.

The gardens of La Granja are extensive and highly esteemed. One great charm of the place, along with its mountain scenery and clear air, is the noise of falling waters, so constantly greeting the ear in its shady promenades. The total extent of the Grounds included within the park wall is 360 acres. The public gardens consist of park-like grounds, adorned with fine elms, chestnuts, limes, with *parterres* and fountains. The prevailing style is Classical Renaissance, copied directly from Versailles. It is claimed, and to some extent with justice, that the copy surpasses the original. The effect of water rising and falling in crystal showers and spray is managed with admirable skill; and the fountains are justly celebrated as among the finest in the world. In all there are no fewer than twenty-six fountains adorned with figures. The principal of these are La Fama, Baños de Diana, Ranas, Ocho Calles, Canastillo, Andromeda, Apolo,

* See illustration of "Centre Portion of Palace."

Neptuno, and Tres Gracias. Though each of these is striking enough by itself, several of them can be combined, when the effect is greatly enhanced. Those named Anfitrite, Cascada, and Tres Gracias are combined in the splendid vista seen from the Throne-room in the palace, as well as from the esplanade beneath, and which is known as the Cascada Nueva. The Carrera de Caballos includes a vista of no less than eight fountains rising one above another, and terminated by the fine group of Andromeda. Not every day, nor even every month, can all the fountains be seen in full play. This grandiose spectacle is reserved for six days in the year, the feasts of the patron saints of the Royal Family. We had the good fortune to be present on one of the most recent occasions. There was a rush among the crowd of people present to see, first one, and then another, of the several most famous fountains in full play, for the few minutes allowed to each. Those of the Grand Cascade, Carrera de Caballos, Ocho Calles, Canastillo, and La Fama were successively visited and admired. The two first series are remarkable for their magnificent vistas, for the height to which the waters rise, the admirable effect of the falling spray amid the surrounding foliage, and the part played by the statues amid the descending showers. The eight fountains of the Plazuela, called Ocho Calles (eight avenues) were less effective than the rest. The effect of this group is spoiled by gilding. However, this unfavourable impression was made up for by the play of the lovely Canastillo (Basket) seen from the same spot. La Fama is remarkable for the surprising height of 130 ft. to which the central jet rises.

ANCIENT AQUEDUCT, SEGOVIA.

There are many points from which the Roman Aqueduct of Segovia shows forth to such advantage that the rest of the monuments of that city seem to grow small by comparison. One of the best stations from which to see it is in the Plaza de Azoquejo, whence the full height of the loftiest part, 102 ft., can be well seen. The greatest altitude is at the point in the view shown in our illustration where there are three additional courses of masonry above the two or three arches rising highest of the lower tier. The distant view of that same part is likewise imposing, as the city seems thence quite dwarfed to insignificance by the side of the grand old Aqueduct. Even though in part destroyed by the Moors (not, indeed, the part now under review), about the year 1072, it was repaired towards the end of the fifteenth century, by order of Isabella the Catholic, and so to this day brings the fresh stream of Riofrio from the Sierra Fuenfria in the Guadarrama Mountains, a distance of three leagues. It is built of granite.

The Aqueduct begins near San Gabriel, and is carried on with a slight declivity of about 1 in a hundred in a series of curves and angles to La Concepçion, San Francisco, and thence in one grand sweep of some 900 ft. to the city wall, the whole length being about half a mile. The total number of arches is given by Mr. Ford as 320, out of which thirty-five or thirty-six were broken down by the Moors. During succeeding centuries the breach was clumsily repaired by woodwork, until Juan Escobedo, a monk of El Parral, of the order of St. Jerome, in Segovia, undertook to repair it for Isabella in 1483.

The author last quoted praises Escobedo for his good taste in imitating the model before him, calling him the first restorer of the Græco-Roman style in Spain. Other observers, and among the rest no less a personage than Marshal Ney, have noticed, on the contrary, a striking contrast between parts of the restoration and the antique, Ney exclaiming (in view of the contrast) "here begins the work of men" (Madoz, "Segovia").

It is, however, evident on a careful examination, that the restorations do not all belong to Escobedo; and Madoz relates that repairs in the more modern masonry having become necessary during the first years of the present century, such repairs were then executed. The lower piers in the centre are built in four stages, each crowned by a simple impost, instead of a capital, the three lower stages being about 12 ft. high, and the fourth about double that much, the whole tier thus rising to a about 60 ft. The lower piers have no pedestal, while the plain, horizontal line above the lower tier forms a sort of simple pedestal for the piers in the upper. The arches are plain, without mouldings of any kind. The severity of the style is very remarkable. This work is truly grand,—we might almost say, sublime,—from its very simplicity.

In respect to the restorations, we were especially struck with the deformed appearance of an arch in the Calle de Cañuelas, whereat it was evident that the Mediæval work had been clumsily joined to the antique. Pointed arches then follow for some distance down that street. It was opposite to Nos. 19 and 20 that the joining had been made. On further examination it become manifest that two different restorations had been effected, one in which the architect,—possibly Escobedo,—had been impressed by Gothic form, as these arches are pointed. This earlier reconstruction is, on the whole, the better of the two. In the later the architect was evidently much more influenced by Classic form, as there is a too prominent horizontal member, a sort of abacus, which does not quite harmonise with the veritable antique. Here, however, the arches are round and well built. This work is in all probability later than the time of Isabella and Escobedo, though it certainly did not give us the idea of being of the present century, and could hardly have been the restoration referred to by Madoz.

SANITARY CONGRESS AT LEICESTER.

INAUGURAL ADDRESS BY PROF. DE CHAUMONT, F.R.S.

THE eighth autumn Congress of the Sanitary Institute of Great Britain was opened at Leicester on Tuesday last, under circumstances which augur well for its success and usefulness. There are about 250 "Associates of the Congress," about one hundred of these being members of the Institute and their friends.

The President of the Congress, Prof. de Chaumont, F.R.S., delivered a very comprehensive address at the opening meeting, which was held in the Lecture Hall of the Museum Building, and was attended by from 300 to 400 ladies and gentlemen. The first part of the address was devoted to the circumstances which led to the formation of the Institute a few years ago, and to a review of the progress of sanitary legislation and administration since the days of the General Board of Health (with which the name of Mr. Edward Chadwick is so honourably associated). It was pointed out that dire as was the loss which we sustained by the annihilation of our soldiers in the Crimea and elsewhere, by disease and not by the sword, out of their terrible sufferings good had come, for it led to the appointment of the Royal Commission of 1857, whose report was one of the most remarkable and instructive documents ever furnished to a Government, the investigation was so complete, the inductions so clear, and the predictions as to the future so fully justified by subsequent experience. The Commissioners were able to point to certain conditions which they believed to be the causes of the evils complained of, and they further said: "Let them be remedied, and there is no reason why the soldier should not be as healthy as the healthiest in civil life." The recommendations of the Commission were acted upon as rapidly as circumstances permitted, and we are now at a distance of thirty years from the former evil days. What are the facts now? The soldier at that time died at the rate of 18 per 1,000 at home, or, to be a soldier in time of peace was more fatal than to be the inmate of the filthiest and most poverty-stricken parts of our crowded cities. The last return, that of 1883, shows that the death-rate at home is only 6·28, instead of 18, and only 5·28, if we exclude violent deaths,—that is, nearly 40 per cent. less than the death-rate of the most healthy districts in England and Wales. Calculating upon 80,000 men, the strength of our home army in 1883, we have 1,032 men saved to the State in one year alone,—and when we add to this the amount of sickness saved, we find that it represents the services of 800 men for a whole year, so that, practically, a saving of two battalions has been effected. "The case may be made even more startling," said the Professor, "if I state that, at the time I myself entered the army there were dying of consumption alone more men in two years than now die from all causes whatsoever in three! Similar valuable lessons were deduced from the experience of sanitation as applied to the circumstances of our troops in India, the West Indies, and elsewhere, and the popular ascription of heavy mortality and sickness rates to "the climate" was shown to rest upon a very slender foundation. Having reviewed the work of the Institute in the past, Professor de Chaumont continued:—The Institute, however, has not considered that the arrangement of annual meetings like this has been sufficient for the work before it. Meetings and addresses have been given from time to time in London, and we hope that the time is not far distant when something like a school may be established, with a staff of teachers, laboratories, museums, &c. For this purpose it will be necessary to gather together into one centre the scattered efforts which are being made in the same direction, but which are at present, from want of union, somewhat dissipating energy in an unproductive way. . . . The advantages of unity in administration, both as a question of efficiency and of expense, have been much dwelt upon by our friend and veteran sanitarian, Mr. Edwin Chadwick. There can be no question that a more uniform and united system would greatly add to the efficiency and materially diminish the expense of sanitary work. But the apparent outlay is not all, for the indirect expense produced by inefficiency is vastly greater than any direct outlay likely to be incurred, however extravagant. A premature death is reckoned as a loss of 100*l.*, and if it is the head of the house and the breadwinner, it is evidently much more. If we double this estimate it will be less than the probable coincident damage, due to the loss of time from the proportionate amount of sickness which each death represents. There are about 750,000 deaths every year in the United Kingdom, about one-half of which are deaths of children, or of persons in the unproductive periods of life; of the remainder, pretty nearly one-third are distinctly preventible. Could those deaths be prevented we should save (on the above calculation) a sum of 25 millions per annum, or little short of the amount we pay yearly for the interest of the National Debt. Other calculations have brought out even higher figures, but they all agree in one thing, viz., that we are as a nation paying yearly an enormous sum for our sanitary shortcomings, a sum undoubtedly less than we used to pay, but still very large,—a sum, too, that would rapidly increase if our vigilance were in any way relaxed. It is the aim and object of sanitation to reduce and, if possible, to extinguish this gigantic burden, which represents about one-sixteenth of the entire taxable income of the country. But even this is not all, for besides the immediate losses from sickness and mortality, we have the remoter effects in weakened health and enfeebled offspring, every lowering of the health standard preparing a fertile soil for future disease and the perpetuation of the scourges of humanity. We may, however, take comfort from the good results that have arisen from such united effort as has already been put forth, and we may congratulate ourselves on the progressing diminishing mortality generally, and the control which has been established over some of our most virulent diseases. Much, of course, is due to the increasing well-being of the poorer classes, in spite of the outcry about depression of trade. Such ebbs and flows are inevitable, but on the whole the people generally are better off now than they have ever been,—at any rate, within any period of which we have trustworthy records. It has sometimes been said that the rural population were better off in former times when the population was less. In some particulars this may be the case, but I think on the whole the balance is in favour of the present day. If I should be wrong in this view, then it only strengthens the other part of the argument, viz., that the sanitary efforts of modern time have been even more productive of benefit than they seem to have been at first sight. Our statistics before this century are very imperfect, but it has been shown by comparison of the bills of mortality that the death-rate in the metropolis in the seventeenth century was between 70 and 80 per 1,000 per annum; in the eighteenth century it fell to about 50, and towards the end of the century to about 30. At the time of the commencement of systematic registration, about fifty years ago, the death-rate was more than 25 per 1,000 (actually 29·55 in 1838, and 25·63 as the average of five years, viz., 1838–42), whereas the whole of England was only 22·60 in 1838, and 22·02 of the five years, 1838 – 42. A quarter of a century

later the rates were—for London, 22·6; for England and Wales, 21·7; and the great towns, 23·4. London was therefore healthier than the average of the other great towns, and only five per cent. behind all England and Wales, whilst in the earlier period it was 17 per cent. behind, and in 1838 33 per cent. behind the country generally. In the later returns the figures are even more satisfactory, the London death-rate being only 21, or about the same as that of the country generally. We must remember also that this improvement has taken place with a progressively increasing number of persons in the area concerned, even although the area is also continually extending. In 1831 there were less than 44 persons to an acre in the metropolis, and in 1841 just under 46. In 1883 there were 52·5, and at present probably over 54. In 1883 the area per head was only 92·2 square yards, and the proximity, or distance from person to person, if equally distributed over the area, was 10¼ yards, or nearly 31 ft. At the present time it is probably not more than 10 yards or 30 ft. . . . . I have spoken hitherto chiefly of general death-rates, but these, although valuable, are less sure marks of improved sanitation than particular death-rates, and more especially those from particular classes. The three most significant are: (1) the deaths of children; (2) the deaths from consumption; and (3) those from zymotic diseases. With regard to deaths from consumption, the disease of all others most constantly fatal, three main causes have been assigned, viz.: (1) hereditary predisposition; (2) faulty nutrition; and (3) impure air. I do not propose to discuss the first cause, partly because it is too difficult a question to treat of in the time at our disposal, and partly because it is less directly connected with the immediate subject on hand. I would only say that the fact of hereditary predisposition is pretty generally recognised, and that it is only by improved sanitary conditions that there seems any chance of mitigating or extinguishing it. Of the second cause much has been written, and there can be no doubt of the fact that faulty nutrition is a very important factor. But the most important factor of all is undoubtedly the third, namely, impure air, the rebreathing of air already charged with the impurities of respiration and transpiration. Such impurity appears especially to favour the growth of the bacillus which has been shown to be the probable active agent. I think we may, therefore, justly infer that the diminution in consumptive complaints is due to the improvement in the well-being of the community, and the better housing of the poor. Consumption, however, is a disease of the rich as well as of the poor, and in the case of the former it has been largely favoured, if not caused, by their being too well housed, in the sense that there has been too great a barrier between their living and sleeping rooms and the external air. The best security against the development or propagation of the disease is free ventilation, and the avoidance, of course, of chilling draughts. On this subject the experience of the Army is very instructive. Before the Crimean War the annual death-rate of the army at home was 18 per 1,000, and of these deaths nearly 8, or 44 per cent., were from consumption. But this did not represent all, for some men were invalided, who died as civilians, and, if we add these, we should have a loss of at least 100 per cent. more. This would bring the loss up to at least 16 per 1,000 from consumption alone. The data, however, are imperfect. The Royal Commission of 1857 showed clearly that this inordinate amount of disease was due chiefly to the bad ventilation of the dormitories, and steps were taken to remedy this as soon as was practicable. Accordingly, in 1861 the consumptive deaths were only 3·1 per 1,000, and the invaliding about 8 per 1,000, or a total loss of 11 per 1,000. In 1883, our latest information, we find that the deaths were only 1·72, and loss by invaliding 3·47 per 1,000, or a total loss of 4·19 per 1,000. In the same year the total deaths from all causes of disease were only 5·28 per 1,000,—one-third less than the deaths from consumption alone thirty years ago. But satisfactory as the results of sanitation have been, we are not at all entitled, nor are we inclined to rest and be thankful. We have still before us the fact that our consumptive death-rate among the troops is excessive. . . . . The third group of importance is that of Fevers. Under this head there are three distinct forms, viz.:—Relapsing or famine fever, typhus fever, and enteric or typhoid fever, besides an anomalous class called common continued fever, which will probably diminish or disappear as diagnosis becomes more accurate. Typhus fever, also called spotted fever, putrid fever, jail fever, &c., is a disease connected with destitution, crowding together, and dirt. Once started, however, it is capable of being communicated by direct contagion in a very rapid and fatal manner, and this by individuals not themselves the subjects of the disease, as witness the story of the Black Assizes at Oxford. It is looked upon as the most contagious of all known diseases, but fortunately its contagion does not spread far. It is most completely amenable to hygienic measures, for it is generally sufficient merely to scatter the population and allow free aëration to put a stop to it. Accordingly, it has now become very rare in England, although we have occasional small outbreaks in crowded cities, such as Liverpool and Dublin, when there is much poverty and wretchedness. But a much more important disease is enteric or typhoid fever, which was up to forty years ago confounded with typhus (and is still called abdominal typhus on the Continent). By the labours of Stewart, Jenner, and others, it was definitively separated, but continued to be merged in the group of fevers by the Registrar-General until the year 1869. This disease, we now know, owes its origin to a very different cause from true typhus, being a disease connected with bad drainage or insufficient removal of excreta. It turns up in all parts of the world and harasses troops whenever they are gathered together. Its presence is a very sure indicator of insanitary conditions. It attacks the young by preference, although the old are not entirely exempt from it, and it is as much a disease of the palace as of the hovel."

On the motion of Mr. T. T. Paget, M.P., seconded by the Mayor of Leicester (Mr. Israel Hart), the thanks of the meeting were given to Professor de Chaumont for his address.

AWARDS AT THE LEICESTER SANITARY EXHIBITION.

The following are among the awards which were announced at the opening of this Exhibition on Tuesday last:—

Medals and Starred Certificates.

Bourtreehill Coal Co., Dreghorn, Ayrshire, for white enamelled fireclay cistern.
*Calvert, F. C. & Co., Manchester, for carbolic acid for disinfecting purposes.
Elgood Bros., Leicester, for artistic domestic ironwork.
Ellis, J., & Sons, Barrow-on-Soar, for Barrow blue lias hydraulic lime.
*Ellison, J. E., Leeds, for conical ventilators.
Jeyes's Sanitary Compound Co., for Jeyes's "Perfect Purifier."
Johnson, W. F., Leicester, for ornamental domestic appliances.
Leggott, W. & R., Bradford, for openers for fanlights and skylights.
Lyon, J. W., London, for steam disinfector.
*Maignen, P. A., London, for "Filtre Rapide."
*Morrell's Sanitary Appliance Co., Manchester, for portable cinder-sifting ash-closet.
*Moule's Earth Closet Co., for Moule's earth closet.
Richardson, J., & Co., Leicester, for their exhibit of antiseptic preparations.
Sanitary and Highway Appliance Co., Sheffield, for Roberts's street orderly bin; another for Roberts's sand distributor for two-horse tram track.
*Stott, J., & Co., London, for mercurial gas governor.
*Trott, H., Battersea, for the "household closet."
Victoria Stone Co., London, for Victoria artificial stone paving.
Willacy, R., Preston, for sand distributor for roads.

Certificates of Merit.

Adams, R., London, for the Victor spring hinge.
Adams & Co., London, for Potts's Edinburgh sewer trap; another for improved shape of trough for water-closets.
Ashwell, F., Leicester, for Blackman air-propeller.
Bourtreehill Colliery Co., Dreghorn, Ayrshire, for white enamelled sinks and wash-tubs.
Broad & Co., Paddington, for white enamelled straight and curved channels for inspection-chambers to drains; another for white enamelled fire-clay gullies.
Croft Stone Quarry and Brick Company, Croft, Leicestershire, for the Croft artificial stone paving.
Doulton & Co., London, for economical Combination closet in two pieces.
Ellis, J. J., Ellistown Collieries, for Gordon's disconnecting trap.
Fergusson & Starkey, Leicester, for "unbreakable" fireclay lavatory basins for schools, &c.; another for Shanks's porcelain lavatory fittings; another for Shanks's "Eureka" spray and plunge bath.
Foster & Pearson, Nottingham, for Morris's cast-iron gully, with movable dip-pipe.
Gent, J. T., & Co., Leicester, for electric bells.
Goode & Co., Loughborough, for double valves for flow and return in hot-water circulation; another for "Invicta" flushing cistern.
Greenall, T., Manchester, for Greenall's steam washer.
Humpherson, F., & Co., Chelsea, for siphon water-waste preventer; another for "Beaufort" flush-down closet.
Johnson, W. F., Leicester, for galvanised-iron dust-bin.
Kirk, E. G., Huddersfield, for night-soil-receptacle, with spring lid.
Kite, C., & Co., London, for telescoped wall inlet ventilator.
Maignen, P. A., London, for the soldier's filter.
Midland Educational Company, Leicester, for the "Reliance" lift-up desk.
Nightingale & Co., Great Grimsby, for method of wood-block flooring.
Pringle, R., M.D., Blackheath, for working model of cattle drinking-trough.
Sanitary and highway Appliances Company, Sheffield, for Roberts's asphalte cauldron.
Sharman, Leicester, for heating apparatus for small greenhouses.
Smith, E., & Co., Coalville, Leicester, for embossed tiles; another for photographic embossed and incised tiles.
Smith, J., & Sons, Wolverhampton, for closed sectional sanitary van.
Stiff, J., & Sons, Lambeth, for Weaver's ventilating sewer air trap; another for exhibit of architectural terra cotta.
Taylor & Co., Driffield, for "Simplex" desk, with adjustable foot-board.
Verity, E. & J. M., Holborn, for Crabtree's kitchen range.
Warner, J., & Sons, London, for lever nut for boiler cock.
Whitwick Colliery Co., Coalville, Leicester, for their exhibit of terra cotta.
Wortley Fire-clay Company, Leeds, for white enamelled straight and curved channels and channel junctions for inspection chambers to drains.
Wragg, T. & Sons, Burton-on-Trent, for Gordon's junction blocks for lampholes and inlets to sewers; another for Gordon's disconnecting trap.
Wright, Bros., Leicester, for Gordon's ventilating manhole cover for sewers, with annular dirt-box; another for Gordon's ventilating cover for disconnecting trap.

Among the exhibits "Deferred for Competition for Medals" are the following, viz.:—F. Ashwell (Leicester), Blackman Air Propeller; F. Humpherson (Chelsea), Siphon Water-waste Preventer; and E. Smith & Co., Coalville (Leicester), Embossed Tiles and Photographic Embossed and Incised tiles.

A number of exhibits are reserved for further and more complete practical trial than is possible at the Exhibition before the judges give their awards. Among the exhibitors concerned for these exhibits are Messrs. W. White (Abergavenny), J. Ellis & Sons (Barrow-on-Soar), F. Humpherson (London), H. Swete (Worcester), J. Warner & Sons (London), The Patent Porous Carbon Co. (London), Thompson & Co. (London), T. Jennings (London), Adams & Co. (London), J. Stiff & Sons (London), G. T. Worssam & Sons (London), H. Trott (London), T. Wragg & Sons (Burton-on-Trent), J. Knowles & Co. (Burton-on-Trent), Carter & Lees (Oldham), J. E. Ellison (Leeds), W. Paulson (Loughborough), Mawson & Swan (Newcastle-on-Tyne), Bowes Scott & Read (London), Wortley Fireclay Co. (Leeds), Broad & Co. (London), F. Dyer (London), Æolus Water Spray Co. (London), Kite & Co. (London), F. Ashwell (Leicester), Ewart & Son (London), Doulton & Co. (London), Wright & Co. (Birmingham), T. Fletcher (Warrington), Arden Hill & Co. (Birmingham), General Gas-heating & Lighting Co. (London), H. & C. Davis & Co. (London), Patent Safety Gas Stove Co. (London), J. Wolstenholme (Manchester), and W. Barstow (Pontefract).

The judges, in concluding their report, say:—

"Several exhibitors show Stanford's joint for stoneware pipes. For this excellent invention the medal of the Institute was awarded at the Stafford Congress in 1878, and starred certificates equivalent to medals have been awarded for it at subsequent exhibitions. This joint is now so well known and fully appreciated that the judges do not think it necessary to make any further award for it.

"The cowls, and ventilators of that class, have been deferred for further practical trial, although the report of the Cowl Committee has not yet been issued, because the investigations of this committee are now so far advanced that it is anticipated that the judges will be able to test the cowls and other similar ventilators before the next anniversary meeting."

The following is a list of the judges:—Professor W. H. Corfield, M.A., M.D.; Mr. H. Saxon Snell, F.R.I.B.A.; Mr. W. Eassie, C.E.; Mr. Rogers Field, B.A., C.E.; Mr. Ernest Turner, F.R.I.B.A.; and Mr. J. Wallace Peggs, A.M. Inst. C.E.

* These exhibitors have received "starred certificates," equivalent to medals, they having taken medals at former exhibitions of the Institute.

Liverpool Architectural Society.—The ninth meeting of the Junior Debating Club was held at the Rooms, No. 9, Cook-street, on the evening of the 21st inst., Mr. C. J. Andersson in the chair. Mr. Alexander Goodall (visitor) read a paper, entitled "A Few Notes on Plaster-work," which elicited a good discussion. The meeting, which was the concluding one of the session, then occupied itself with the consideration and emendation of the draft of the annual report of the Club to the Council which, in its ultimate form, was directed to be lodged with the hon. secretary of the society.

Illustrations.

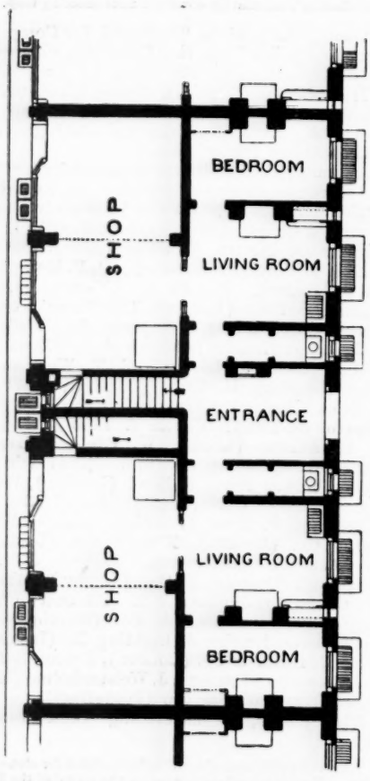
SAN ILDEFONSO; AND AQUEDUCT, SEGOVIA.

FOR some account of the Spanish Royal domain of San Ildefonso, and of the ancient Roman aqueduct at Segovia, see the article entitled "Notes in Spain," p. 420, of this number.

ARTISANS' DWELLINGS, PETTICOAT-SQUARE, LONDON.

BETWEEN the years 1877 and 1879 the Commissioners of City Sewers under, the provisions of the Artisans and Labourers' Dwellings Act, 1875, cleared two large sites in the City for the purpose of enabling dwellings for the working classes to be erected thereon. On one of them,—the Petticoat-square site,—Artisans' Dwellings, the subject of one of our illustrations this week, have been erected.

The site comprised nearly all the property lying between the rear of the houses in New-street, Harrow-alley, the Metropolitan Railway, and the rear of the houses in Middlesex-street. Altogether 164 tenements were demolished.



Plan of Shops and Dwellings.

Plan showing one-room, two-room, and three-room Dwellings.

Including the courts and alleys, the area cleared was 79,198 feet superficial, or upwards of two acres. Plans were prepared for the erection of the dwellings by the Engineer to the Commission, and tenders for the work were received on the 20th of November, 1883, and the works were commenced on the 10th of December following.

The buildings consist of five blocks, and are named respectively North, Prince's, Queen's, King's, and South Blocks. The lengths of the blocks vary from 158 ft. to 221 ft. They are of a uniform width of 30 ft. from out to out of walls. Their height from the pavement level to the top of the parapets is 58 ft. There are basements only to three blocks, viz., the North, King's, and South Blocks. These basements are under the shops which front to Harrow-alley and Stoney-lane. Great attention has been paid to the drainage of these dwellings. All rainwater-pipes, sinks, &c., are cut off from direct communication with the sewers, and have proper specially-constructed traps, for making the requisite connexions. Each of the five blocks is five floors in height, counting the ground-floor. The floors throughout are fireproof, and constructed of Portland cement and coke breeze concrete on rolled iron joists. These joists are wholly cased in with the concrete. The living-rooms and bedrooms have wooden floors laid over the concrete on fir joists.

An idea of the general principle of arrangement of the rooms will be obtained from the two portions of plans given. There are in the five blocks forty-three three-room tenements, 174 two-room tenements, and twenty-four one-room tenements, making a total of 241 tenements in all. Each living-room has a range, with oven, &c., and all the other rooms have stoves; the ranges and stoves have cast-iron mantels and shelves. There is a cupboard in each living-room, fitted up with shelves to serve as a pantry. These cupboards are ventilated by openings in the external walls, with iron gratings covered with perforated zinc. Beneath the cupboards, shut-up coal-bunks are found. All the sleeping-rooms have hanging closets, picture-rails, &c. The internal walls and ceilings throughout are rendered in Portland cement, and are finished in Martin's Cement and coloured. The staircase walls and passages are lined throughout with white glazed bricks, with coloured plinths and borders. The handrails are formed in the brick walls with glazed bricks, and, being sunk, are not liable to injury from the removal of goods. The stairs are formed of concrete, with iron ties. There are two water-closets to each floor of each subdivision, or about one water-closet to every four rooms. The roofs are flat, and formed of breeze concrete covered asphalte, and are used for clothes-drying.

The total cost of these dwellings has been as follows, viz.:—For purchase of property, trade compensation, &c., 120,526*l.*; and for building the dwellings, including drains, pavings, boundary walls, legal and other charges, &c., complete 80,889*l.*

The whole of the buildings were completed and opened in March last. The works have been carried out from the designs of and under the immediate supervision of Colonel Haywood, M.I.C.E., F.R.I.B.A., the Engineer to the Commission of City Sewers, by Mr. Mark Gentry, of Stratford.

FRESCOES IN THE CHAPEL OF THE MERCERS' COMPANY.

THESE frescoes were painted recently for the Chapel of the Mercers' Company, by Mr. P. H. Newman. The walls of the chapel having been previously painted, so rendering spirit fresco inadmissible, the artist painted them on canvas, taking care that Mr. Gambier Parry's medium should have as much grip on the coarse cloth as on the usual granulated wall surface; "the preliminary stages resulting in a ground delightful to work upon, and as enduring as an Egyptian cere-cloth." The canvas was stretched with copper tacks on yellow pine frames. The size of the paintings is 10 ft. by 6 ft.

The connexion of the subjects with the Mercers' Company lies in the history or tradition that Becket was the son of a Citizen Mercer. Twenty years after the murder of Becket, his sister, who had married Fitz Theobald de Helles, built a chapel and monastery of Augustine Friars, close to Ironmonger-lane, Cheapside. The hospital was built on the site of the house where Becket was born, and was given to the Mercers by De Helles and his wife. The subject of the other fresco, the well-known history of the murder of Becket, needs no explanation.

BIJOU RESIDENCE, HITCHAM VALE, TAPLOW.

THIS house has been erected upon the estate of Mr. Harvey Ranking, as a type of country residence to meet the present requirements in this locality.

The old materials from a late fire have been re-used. All interior woodwork is darker stained, the drawing-room only being painted enamel cream colour.

The contract has been carried out by Mr. G. Almond, of Burnham, at a total cost of 705*l.*, and the stable is not yet built.

The architect is Mr. I. T. Walford.

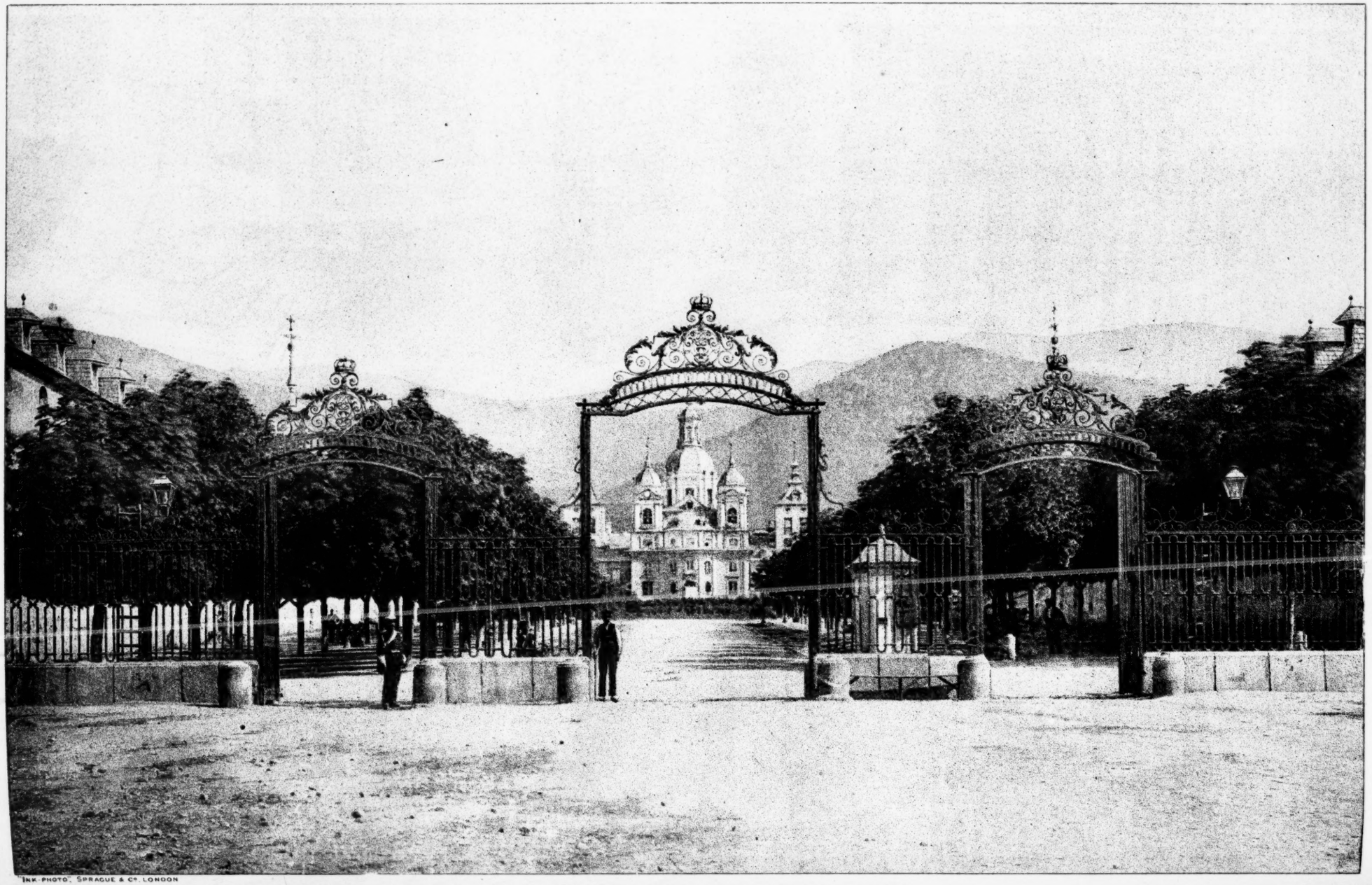
THE CANCER HOSPITAL, BROMPTON.

THIS hospital has existed as a free institution for thirty-four years. It began upon a very small scale, but, owing to the constantly-increasing demands made upon it, the sphere of its operations has been gradually extended through the generous support of a benevolent public.* The building has been entirely reconstructed and enlarged, so as to provide accommodation for 120 in-patients, a large number of out-patients, and a staff of resident officials equal to the requirements of a hospital for 200 beds. The walls built askew are, of course, portions of the old building, which forms the nucleus of the hospital. It is faced with red Fareham bricks and Ancaster stone, the external walls being 20 in. thick with a 2-in. hollow space, so as to ensure perfect dryness and to assist in equalising the temperature of the wards at all seasons. The principal wards average 55 ft. by 25 ft., and 14 ft. high, the floor space per bed being 116 ft. The floor construction throughout is of wrought iron and concrete, the surfaces of the wards and other rooms being laid with Hungarian oak in 4-in. widths, rebated and under-nailed. The internal walls are fixed with Parian cement on a backing of Portland cement, and most of the lavatories, &c., are entirely lined with glazed tiles. The wards are warmed by double open ventilating fireplaces, placed back to back in the centre of the floor and with descending smoke-flues, a current of fresh air being induced into the body of the grate and passing into the wards at a moderate temperature. The corridors and waiting-rooms are warmed by hot-water circulation, coils being placed in the wards to assist in raising the temperature in extreme weather. The drains are laid in straight lines with manholes at the junctions, each section of drain being ventilated. In the rear of the hospital is a large garden, affording a pleasant retreat for the inmates, and with ample space for any future extension.

The works have been executed by Messrs. Laurance & Sons under the superintendence of Mr. Graham, the architect to the Governors.

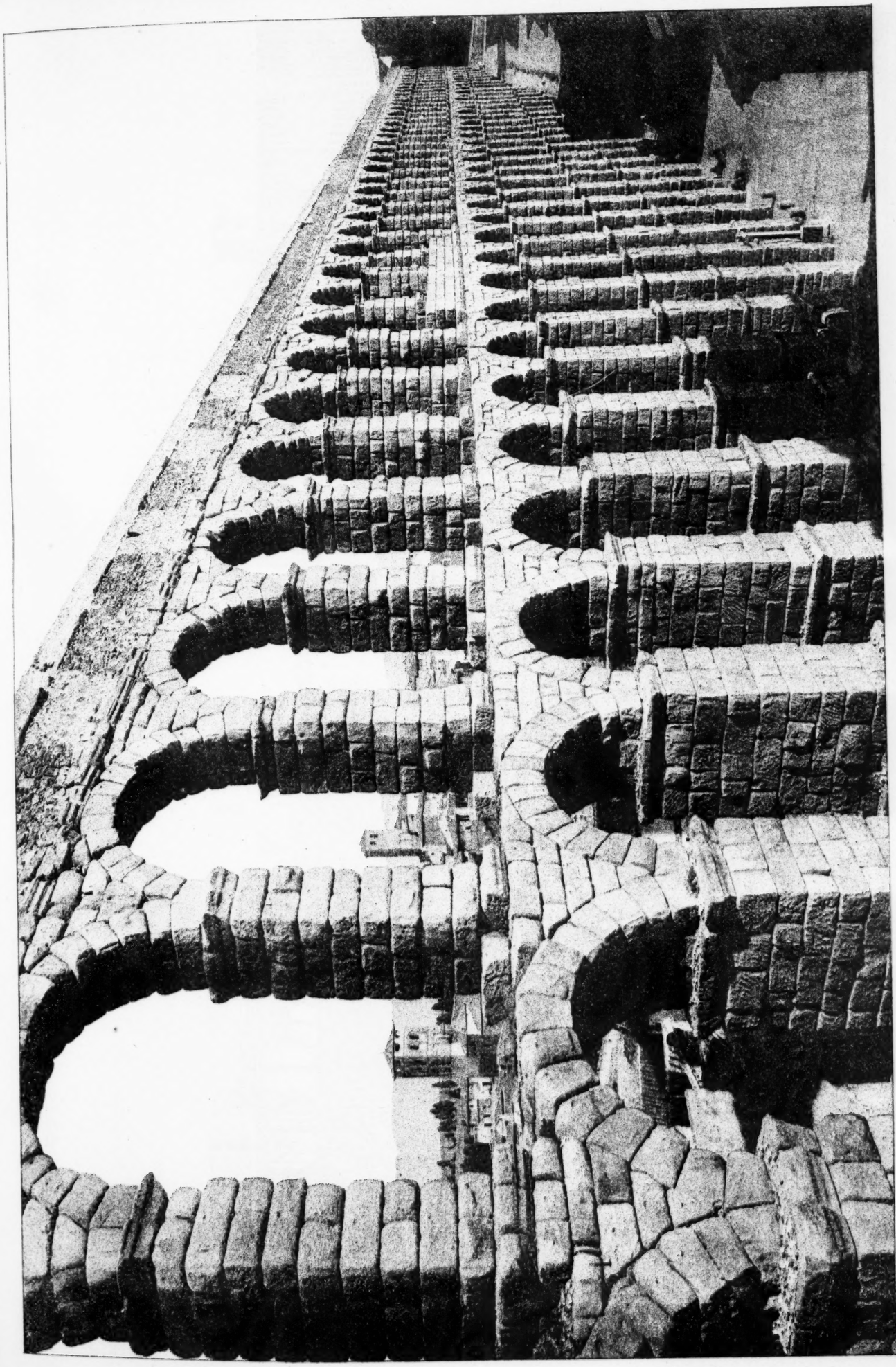
The Architectural Association.—As will be seen by an advertisement on our front page, a special excursion of the members of this Association will be made on Saturday next, October 3rd, to Bisham Abbey and Great Marlow. At the Abbey House special facilities will be afforded for sketching.

* Since its foundation it has relieved nearly 24,000 persons suffering from this malady. No restriction is placed on the admission of outpatients, the number of which amounts to nearly 500 constantly under treatment.



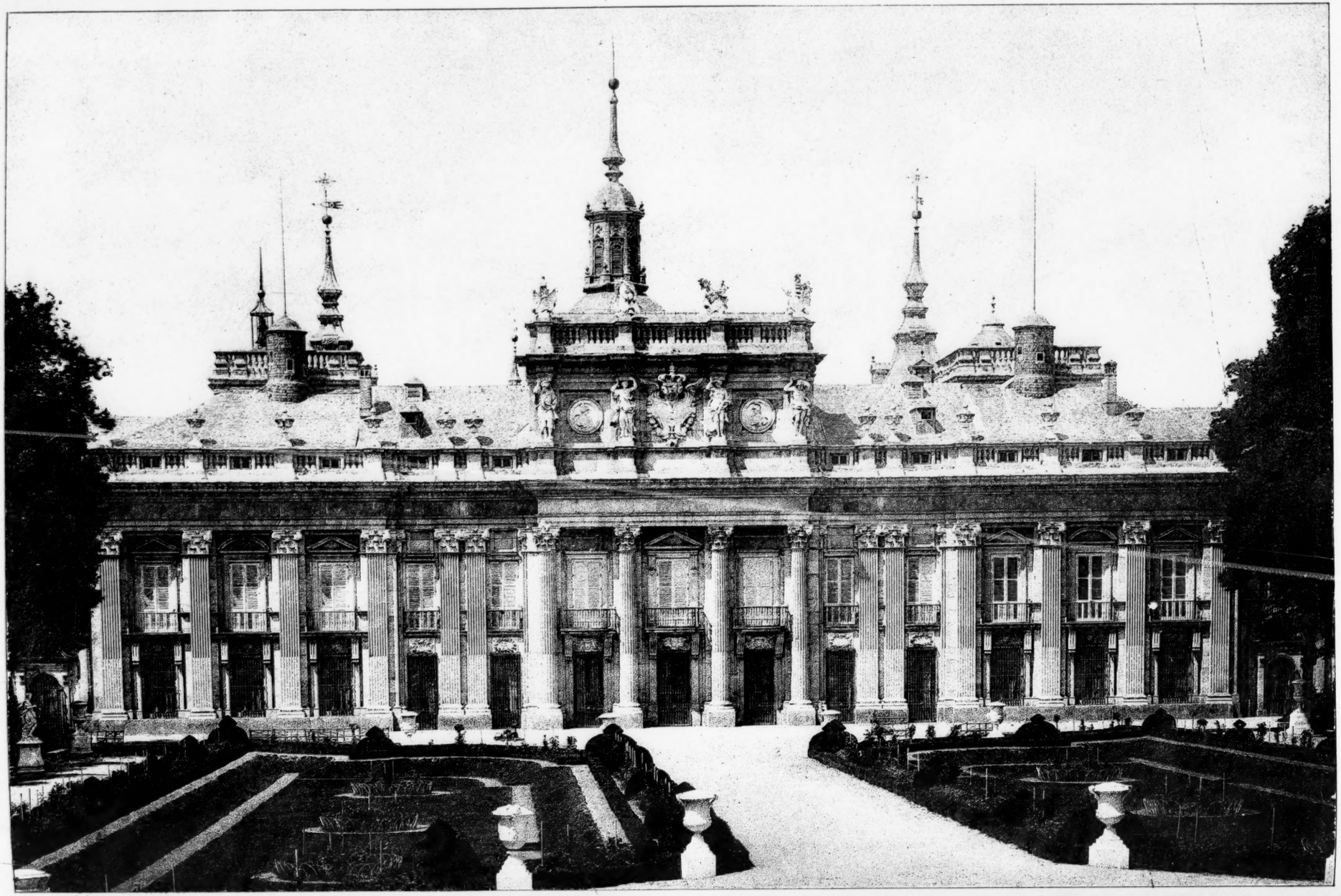
INK-PHOTO. SPRAGUE & Co. LONDON

SAN ILDEFONSO.—ENTRANCE TO THE ROYAL DOMAIN.



ANCIENT AQUEDUCT, SEGOVIA.

INK-PHOTO: SPRAGUE & Co., LONDON



"INK-PHOTO", SPRAGUE & Cº, LONDON.

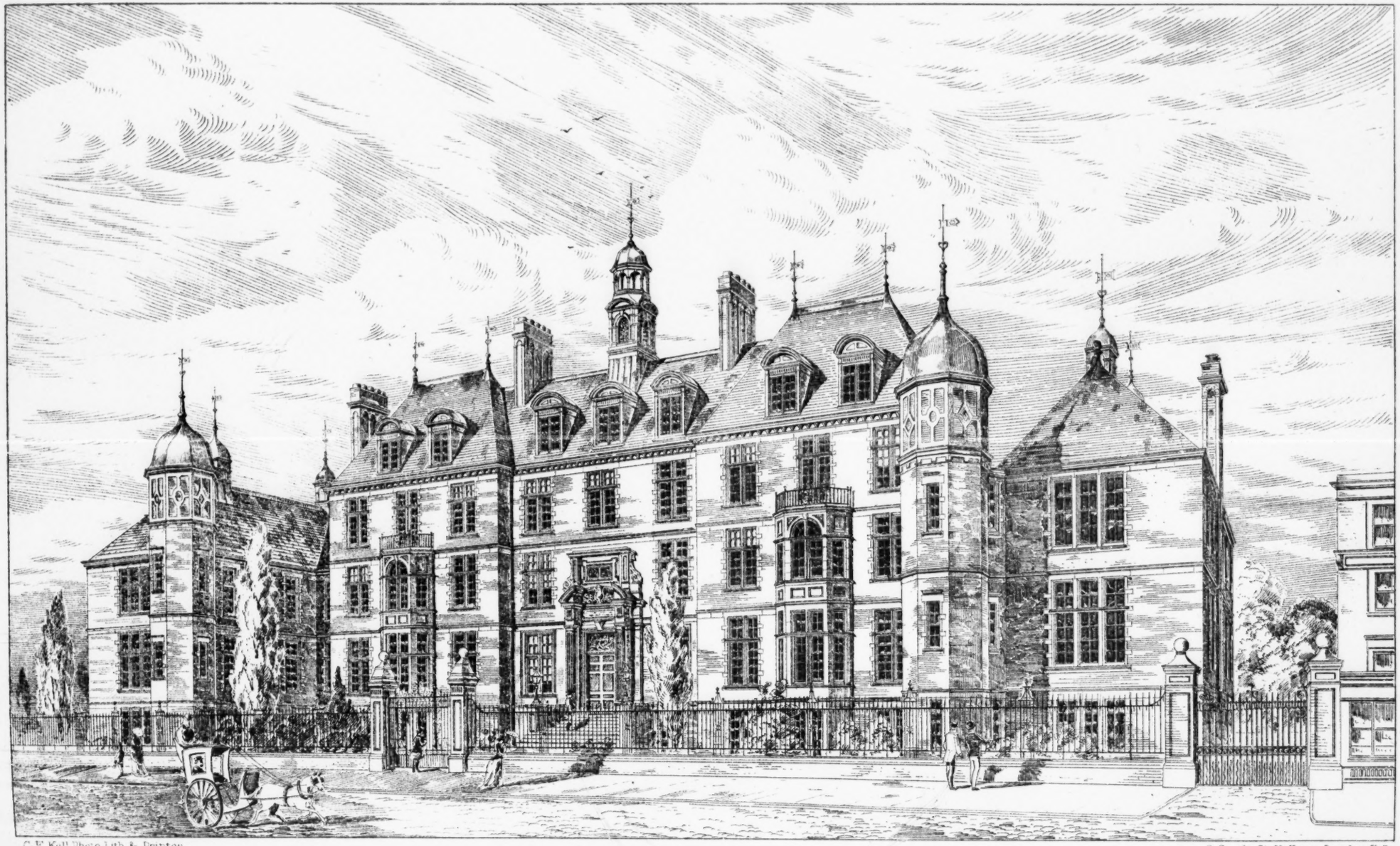
SAN ILDEFONSO.—CENTRE PORTION OF THE PALACE.

THE MURDER OF ST. THOMAS À BECKET.

THE SINGLE OF ST. THOMAS À BECKET GRANTING LANDS TO THE MERCERS.

FRESCOES IN THE CHAPEL OF THE MERCERS' COMPANY, PAINTED BY MR. P. H. NEWMAN.

INK PHOTO: SPRAGUE & CO. LONDON



C. F. Kell, Photo-Lith & Printer. 8 Castle St. Holborn, London, E.C.

THE NEW CANCER HOSPITAL, BROMPTON. MR. ALEXANDER GRAHAM, F.R.I.B.A., ARCHITECT.

THE BUILDER. SEPTEMBER 26, 1885.

C.F.Kell, Photo-Litho. Castle St. Holborn, London, E.C.

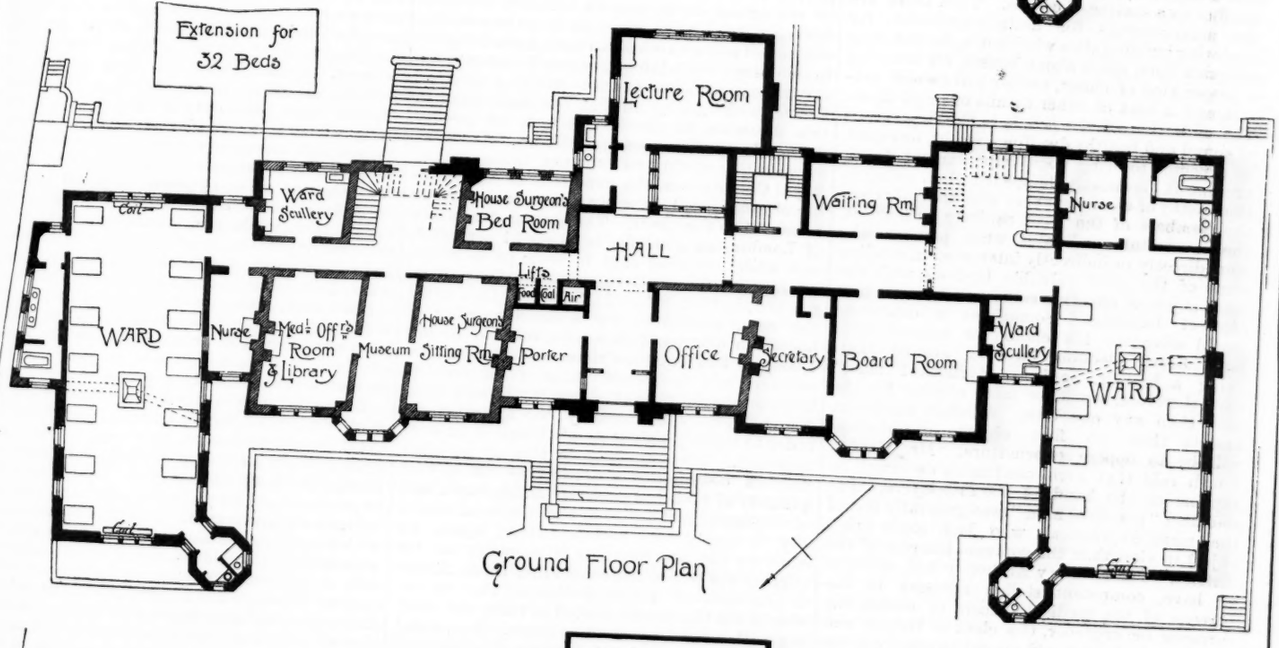
BIJOU RESIDENCE, TAPLOW. MR. J. T. WALFORD, ARCHITECT.

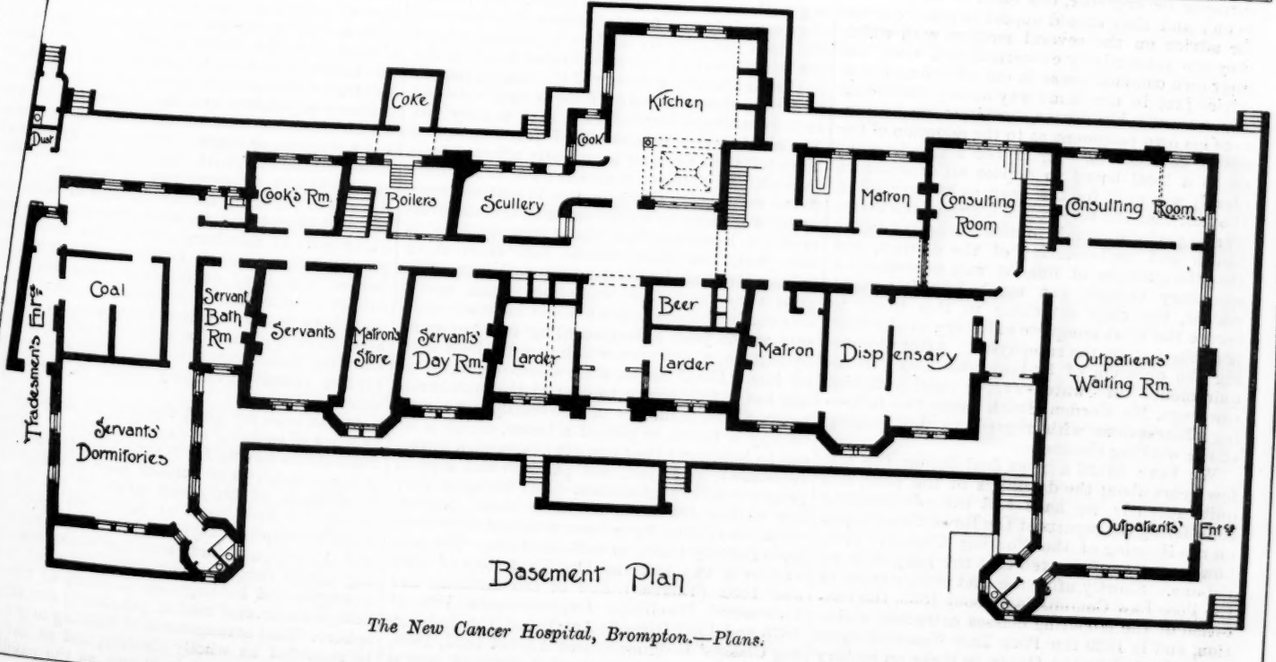
C. F. Kell Photo-Lith & Printer.

ARTIZANS' DWELLINGS, PETTICOAT SQUARE.

8, Castle St Holborn, London, E.C

R. WILLIAM HAYWOOD, M.I.C.E., F.R.I.B.A., ARCHITECT.





The New Cancer Hospital, Brompton.—Plans.

THE HEALTHY HOUSING OF THE PEOPLE.

SANITARY INSTITUTE OF GREAT BRITAIN.

THE address given on Thursday last by Mr. Percival Gordon Smith, F.R.I.B.A. (Architect to the Local Government Board), as President of Section II. ("Engineering and Architecture"), contained some very interesting observations on many of the numerous questions which are included within the scope of those branches of the constructive arts, especially as they affect the physical health of the people. It included a *résumé* of the legislation of recent years as affecting sanitary progress, and a review of the administrative labours of the Local Government Board. Mr. Gordon Smith pointed out that the education of the public in the appreciation of what is healthy, and the desire to adopt proper sanitary arrangements, cannot fail to encourage, among other measures of advancement, the adoption and efficient application of proper codes of by-laws as a means of controlling the details of the construction of domiciliary buildings; and this,—the value of which can hardly be over-estimated,—is, he thinks, gradually progressing in a surprisingly rapid manner. Looking back some fifteen or twenty years, how rare was it then to find even such common arrangements as disconnected waste-pipes and ventilated soil pipes, arrangements which now-a-days many people look for in one form or another as a matter of course. Then there are the arrangements for drain ventilation, for rendering building sites wholesome, for securing adequate open space about houses, for ensuring a proper kind of closet, proper privies and ash-pits, and a host of other details of importance. The education of the people in the importance of sound and healthy dwellings might, he urged, be expected to bring about improvement, for at present it frequently happened that, owing to the apathy of the ratepayers who annually elect the members of the local sanitary authorities, the successful candidates were persons who were directly or indirectly interested in evading some of the most valuable by-laws, with the main object of effecting some saving in the first cost of building. Sometimes a candidate would advocate his claim for support at a local board election on the ground that, being a builder, he is a "practical man," and, therefore, would be more eligible for the post than any one else. Another candidate asserts that his first object on election will be to oppose expenditure. Mr. Gordon Smith said that such candidates deserved no support at the hands of the ratepayers. The so-called "practical man" was generally one of the most unpractical, who had some other object in view than the common interest of the district. The Sanitary Authority had, or ought to have, competent skilled advisers in the persons of the medical officers of health, the surveyor or engineer, the clerk or lawyer, and so on; and they should appeal to those officers for advice on the several matters with which they are respectively concerned, and then use their own common sense in the adoption of that advice just in the same way as any individual who consults his doctor, architect, or lawyer, uses his own judgment as to the adoption of the advice he receives. Again, the man who went on to a local board to oppose all expenditure clearly was unfit for the post, as he overlooked the fact that the very *raison d'être* of the Board was to perform certain duties necessary to the health and well-ordering of the district, and that the question of finance was necessarily a secondary though not much less important matter, the duty attaching to this being to secure the most complete efficiency at the least possible cost to the ratepayers. After discussing the question of by-laws and also the requirements of water-supply and efficient sewerage, Mr. Gordon Smith made the following observations with regard to the housing of the working classes:—

We have heard a great deal during the last few years about the dwellings of the poor, and quite recently we have had the advantage of considering the reports of the Royal Commission on the Housing of the Working Classes. It is, however, often forgotten that the subject is an old one. Shortly after the first constitution of the Poor Law Commission, about 1835, the condition of the labouring classes attracted attention, and in 1839 the Poor Law Commissioners were directed by the Queen to make an inquiry on the subject, and in 1842 the results of that inquiry were framed by the secretary of the Commission, Mr. Edwin Chadwick, in a report which, to this day, is regarded as quite a standard work on the subject. The author of that report, I am pleased to say, is still among us, and actively works to promote the sanitary welfare of all classes. The name of Edwin Chadwick, C.B., will ever be honourably associated with the subject of sanitary engineering and architecture. That report also contains a plan suggested by Mr. Sydney Smirke, the eminent architect of that day, for a so-called "public lodging-house," containing in three stories some fifty or sixty separate single-room tenements. Shortly afterwards, societies were formed for the purpose of improving the condition of the dwellings of the labouring classes, and one of these societies, under the presidency of the Prince Consort, exhibited at the Great Exhibition of 1851, a block of model houses. Other societies, having similar objects, became established in the provinces, and various model villages were formed, as at Saltaire, near Bradford, Ackroydon, near Halifax, &c. Still later, we have the effects in the metropolis of Sir Sydney Waterlow's Society, and the trustees of the Peabody Bequest, besides numerous other societies which have produced numbers of small houses, such as those of the Queen's Park and Shaftesbury Park Estates in London, and others elsewhere.

There is thus evidence of much useful work having been done in the way of providing improved dwellings for the people, and some idea of the extent of it may be inferred from the fact that in London alone no less than twelve millions of money are said to have been invested in buildings containing separate tenements for the accommodation of the working classes. But notwithstanding all that has been done in this direction in the last fifteen or twenty years, the problem seems still as difficult as ever, and, according to evidence taken by the Royal Commission, the condition of the working classes is still, in many places, more or less a scandal to the times. The normal death-rate of London, as a whole, is about 21 per 1,000, and when we read that in some parts of the metropolis the death-rate is stated to have reached, in 1882, 44 and 53·7 per 1,000, while the rate, calculated for a small number of houses in one particular part, reached 70 per 1,000, or two or three times as great as the average; and in certain parts of some of the large provincial towns the rate is still said to be "very high," the necessity for agitation, in order to remedy this state of things, is at once apparent. There appears in this, as in other matters demanding attention, to be a vast quantity of remedial power available, but a lack of readiness on the part of those in local authority to apply that power. Here, again, we come to the necessity, as it seems to me, for stirring the public to demand that those elected to positions of responsibility in the matter should use the powers vested in them for dealing with these important subjects. Important they certainly are, for the results of neglect to use the existing powers already possessed have led to such serious overcrowding as to affect the health and working power of the inhabitants in a manner that altogether fails to be illustrated in the death-rate returns, even high as they are. The children are permanently injured by it, and the adults are likewise injuriously affected by it in health as well as in means; for it has been found on inquiry that, on the lowest average, every workman or workwoman in certain overcrowded localities, lost about twenty days in the year, not from illness, but from sheer exhaustion and inability to do work; and this at a very moderate wage per diem would amount in the aggregate to a not inconsiderable sum in the year. Overcrowding in a house is, by statute, a nuisance which can be dealt with by law. Local authorities, moreover, have, or can have, full power to control the number of persons, not members of one family, who may occupy a house, or part of a house, which is let out in lodgings; they can also have such houses registered, inspected, and put into and kept in proper sanitary condition. But hitherto very few authorities have assumed these powers, while many that have been invested with them have entirely failed to enforce them. The provisions of the Artisans' Dwellings Acts of 1868 and 1882 (Torrens), and of the Artisans and Labourers' Dwellings Improvements Acts of 1875 and 1882 (Cross's Acts), and the Labouring Classes' Lodging-houses Acts of 1851, 1866, and 1867, contain very extensive and useful powers for dealing with the subject where desired by the local authority. Local authorities throughout the kingdom have been reminded of these powers, and useful digests of the Acts have been sent to them, and still all the evils,—moral and sanitary,—of overcrowding continue. Let us hope that one of the useful result of this Congress will be to help to stir up the public to demand energetic action of sanitary authorities to use the powers they already possess, and thus diminish the scandalous conditions which have been recently referred to in the Report of the Royal Commission on the Housing of the Working Classes.

With regard to the blocks of artisans' dwellings and model lodging-houses which have sprung up in various parts of the metropolis, and in some of our more populous provincial towns, all will agree that the clearing of crowded areas covered with the worst forms of dwelling-house is in itself a most excellent move; but I look with grave apprehension upon the vast piles of buildings that are often erected with the avowed object of affording accommodation for the people who have been displaced, but which actually get occupied by a different and higher class occupier, thereby tending to aggravate the overcrowding already existing in neighbouring districts. One sees huge blocks,—five, six, or seven stories high,—sometimes singly, and sometimes detached, but in such close proximity to one another that the sun can never reach parts of the internal open spaces, and so that the air in those spaces must be more or less stagnant. Some of these buildings contain hundreds of separate dwellings, each dwelling holding on an average four or five persons. Such buildings, I maintain, are unworthy of their prime object. They may deceive their promoters at first by appearing fairly wholesome and, in comparison with the houses and tenements previously occupied, as being an improvement; but I fear that after the lapse of so many years they will become unwholesome and be regarded with diminished satisfaction, while their death-rate, which in their early years is generally low, will increase. Indeed, in some of the blocks that have been erected in London, there are not wanting indications that, from some cause not at present definitely explained, the infant death-rate has been excessive, and even greater in the block of dwellings than in the surrounding unreformed neighbourhood.

I am confident that the massing together of vast numbers of human beings in dwellings of great height and capacity,—rooms piled one upon another to a height of 60 ft. or 80 ft. or more,—is not a proper system. We cannot with impunity crowd an unlimited number of human beings on a given area. This has been decided with respect to the sick, and is equally evident with respect to children, and similar conditions will, I believe, come to be recognised with respect to people of ordinary health and habits. There are doubtless degrees of relative proportion of people to area according to their condition, and to a certain extent according to the character of the building and its surroundings, but hitherto we have not arrived, so far as I am aware, at the precise limits of proportion of ordinary population to area. The subject is one which deserves careful attention, and, indeed, has not been altogether overlooked by some of those concerned with the more recently designed blocks of dwellings in London. The danger of piling up these dwellings in buildings of great height has received illustration in the older parts of Edinburgh, where the houses, as you are aware, reach eight or nine stories in height, and have no internal connexion with drains; the refuse is removed in tubs daily, and there is an excellent water supply. I am assured on high medical authority that notwithstanding these arrangements, the first cases of typhus almost invariably occur in the upper stories.

It has been my good fortune to have opportunities of noticing the arrangement of various institutions having for their object the housing of large numbers of persons both in health and in sickness of body and mind, of old and of young. I look back at many old buildings, whether hospitals, asylums, workhouses, schools, and the like, and find enormous blocks containing wards ranged along both sides of dark passages, and holding vast numbers of human beings under one roof in practically one atmosphere. That arrangement of building may now be regarded as wholly obsolete, and as having given place to what is known as the pavilion

system, under which the building is sub-divided into a number of separate blocks or pavilions, each containing a comparatively small number of inmates, and affording far greater facilities for effectual ventilation of the apartments, as well as for the access of light and circulation of air about the pavilions. This system in one form or another is now, in principle at any rate, invariably adopted for all well-arranged institutions intended for large numbers of persons, but in many instances I have noticed that the advantages of the separate pavilion system are completely counteracted by the way in which the several pavilions are joined together, solely for administrative reasons, by enclosed corridors in basement, ground, and one-pair stories, and thus, by means of lifts for coals, lifts for inmates, shoots for dust and for soiled linen, staircase well-holes, and the like, the several blocks or pavilions have been most successfully transformed into one uniform building, having one and the same atmosphere throughout every part of it. The objections to these arrangements, by which the prime object of the pavilion system is defeated, are perhaps more conspicuous when adopted in buildings occupied in a number of sick persons or by children, than by any other class of building, and I am under the impression that in England, while we aim with much success at perfection in detail arrangements, we are considerably inferior in many of the broad principles of arrangement to some of our Continental neighbours. The hospitals erected in the last eight or ten years in some of the Continental cities and towns are specially worthy of attention in these respects. Spread over large areas of ground,—in some instances perhaps needlessly large,—the wards being only one story high, absolutely detached one from another or having only a covered way between them, and being limited in size to the requirements of some fourteen to twenty beds each, being raised on arches well above the ground, and arranged so that the patients while still in bed may be wheeled into outside balconies, so as to have the advantage of treatment in unenclosed air. Such hospitals, and they have been fully described in recent works on the subject, seem to me to approach very nearly perfection of arrangement, and to afford examples such as it is difficult to find at home. In respect of children's buildings, again, the dangers of concentrating large numbers of children in dormitories, or, indeed, in any confined space, have long ago been demonstrated as tending to impair the health and to aggravate any tendency to disease. There is no necessity for placing many children in dormitories, and the massing together of large numbers in school and class rooms is only tolerated by reason of the comparatively short time those rooms are occupied. And even here it would be a boon, having regard to the small amount of space usually allowed to each child, if the school and class rooms could be completely vacated, as recommended by Mr. C. E. Paget,* for ten minutes or so every hour, so that, by means of open windows, they could be completely flushed out with fresh air at frequent intervals. The system of arranging domiciliary schools upon what is known as the cottage-home principle, has so many advantages, sanitary and otherwise, that it deserves attention by all who are concerned in the welfare of the young. It has been adopted in recent years for many charitable and poor-law institutions, and I have invariably heard it spoken of most favourably. The schools of the Leicester Poor Law Union, which are at Countesthorpe, are upon this system, and will well repay a visit."

* Health Exhibition Literature, vol. i., p. 378.

CIRCULAR HOSPITAL WARDS.†

THE proposition for constructing hospital sick wards upon what is known as the "Circular System," was first made in this country during the latter part of 1878, about the same time that the foundation stone was being laid in Belgium of a hospital intended to be built upon this principle.

The design for this building, the Antwerp Civil Hospital, having received the approval of the Communal Administration of the town, was referred to the consideration of the Council of Public Hygiene at Brussels, but this body strongly condemned the erection of circular wards upon grounds which, now the building is erected, would appear to have been correct. Nevertheless, the work was proceeded with, and the building is now opened, and may be inspected by those interested in the question.

No other Continental nation has, to my knowledge, considered this new system worthy of imitation, but in England many similar hospitals have been erected, and it is, I believe, in contemplation to erect others.

There is something very fascinating about the conception of a circular ward, and superficial consideration of the question would lead to a belief in the soundness of the arguments advanced in favour of the system; indeed, I was myself disposed, before critically examining the matter, to allow that this adoption might possibly be productive of some, if not all, the benefits promised by its advocates. This illusion was, however, dispelled when lately I had occasion to study the question in all its aspects for the purposes of a report to a public body prepared to erect this class of wards upon my recommendation, and I propose now to show the reasons that led me to the conclusion that parallelogram-shaped sick wards are in every respect much more economical both in first cost and in management, and that no advantage is to be attained by the increased outlay consequent upon the erection of wards of circular shape.

My present remarks will be confined to a consideration of the erection of wards for general hospitals, and I do not propose in this paper to deal with the question in its application to fever or other wards for special cases. Nevertheless, I am equally convinced that the circular system as now advocated is wrong in any kind of hospital building, whatever be its special use or locality; but to deal with the question in its application to other than ordinary hospitals would involve considerations which the time at my disposal on this occasion will not allow of being entered into.

It will be well to consider what are the conditions necessary to be observed in the planning and construction of general hospital wards.

First as to the number of patients. I have the authority of Miss Nightingale, and of many hospital superintendents, for stating it to be essential that, besides the ordinary nurses and attendants, every ward should have the constant presence of one head nurse in the day time and of one nurse at night time, and that those head and night nurses could each properly overlook forty patients as a maximum; but taking into consideration all the essentials for proper discipline and facility of administration, the number of patients in any one ward should not exceed thirty-two or be less than twenty; also, that in all cases one or at most two separation wards, each for the accommodation of one or at most two patients, should be attached to the large ward, but not so as to communicate with it directly. All the wards should, however, adjoin the rooms occupied by the nurse having charge of the patients contained in them.

Except in the case of separation wards, wards of small size are decidedly objectionable, because they are (says Miss Nightingale) "unfavourable to discipline, inasmuch as a small number, when placed together on the same ward, more readily associate together for any breach of discipline than a larger number." * And it is also pointed out by her that one head-nurse, or one night-nurse, could not so efficiently superintend and overlook a number of small wards as one large one.

Each large sick ward, whether it contains ten or thirty patients, must have attached to it at least two water-closets, and a slop-sink, separated by cross-ventilated lobbies. A bath-room should also adjoin each large ward. It is therefore clear that the fewer the patients in each ward the larger will be the total number of nurses required in the establishment, and the greater will be the multiplicity of nurses' rooms, water-closets, slop-sinks, bath-rooms, and other sanitary offices.

Suppose a hospital, to be designed for the reception of 576 patients, 540 of whom are to be placed in eighteen parallelogram-shaped wards containing thirty each, and the remaining thirty-six in smaller and adjoining separation wards. If the buildings are three stories in height there would be six pavilions, but if, as I shall show, twenty-two patients only can be placed in the large wards because they are of circular shape, then eight pavilions would be required instead of six, and twenty-four wards instead of eighteen. In both cases these wards and pavilions are assumed to be of the same size.

It has been shown that the services of one head and one night nurse must be provided for each large ward, and it therefore follows that the adoption of this circular plan would involve the additional cost of twelve nurses for the six extra wards.

The two extra pavilions containing these six wards would also necessitate the additional services of one scrubber and one porter for carrying coals and meals and attending the fires, furnaces, &c., and the salaries, uniforms, and maintenance of these fourteen additional officers cannot be put at less on the average than 50*l.* a year each, or a total of 700*l.*

The additional cost of fuel for the warming and hot water supply to these two extra pavilions may be put at a minimum sum of 200*l.* per annum, and the outlay for soap, soda, &c., for cleaning, and the periodical white-washing, painting, and repair cannot be put at a less sum than 100*l.* per annum. Therefore, the total additional establishment charges consequent upon the adoption of the circular system would be 1,000*l.*, as follows, viz.:—

12 extra nurses 1 ,, scrubber 1 ,, porter } at 50*l.* per annum each	£700	0	0
Extra fuel	200	0	0
Soap, soda, &c., and repairs.....	100	0	0
Total.....	£1,000	0	0

This sum capitalised at three per cent. (thirty-three years' purchase) would amount to 33,000*l.*, and this represents the additional cost of maintaining the 576 patients supposed to be housed in wards designed upon the circular system.

The additional cost per 1,000 patients would be 57,392*l.*, and this cannot be considered a large estimate, seeing that Miss Nightingale in her work on hospitals shows that where nine patients only are contained in a ward as against thirty-two patients in a ward, the additional capitalised outlay, for nursing only, would be 196,775*l.*

Now, as to the relative cost of erecting the buildings,—a question involving primarily a consideration of the requisite sizes for the wards.

There must be much diversity of opinion amongst medical men and other authorities upon this point if we are to judge from the dimensions of recently-constructed hospitals.

Captain Douglas Galton considers that between 1,200 and 1,300 cubic feet of air space per bed is all sufficient. Miss Florence Nightingale asks for from 1,200 ft. to 1,500 ft. Dr. Parkes, speaking of hospitals generally, says that the space should be from 1,500 ft. to 2,000 ft. (the latter quantity referring, no doubt, to fever, and the former to general hospitals). Dr. de Chaumont in his report upon the Norfolk and Norwich Hospital, shows, upon mathematical bases, that where good ventilation exists no advantage is gained by making the air space of large wards greater than 1,200 feet per patient.

The report of the committee appointed to consider the cubic space of metropolitan workhouses and infirmaries states that the cubic space to be allotted to ordinary sick patients in large wards "should not be less than 850 ft.," but it is stipulated that no space above the height of 12 ft. from the floor line shall be included in the calculation. This committee consisted of the following eminent authorities, viz.:—Drs. Thomas Watson (chairman), Henry W. Acland, Francis Sibson, W. O. Markham, and John Randall, Captain Douglas Galton, Messrs. Uredale Corbett (Local Government Board Inspector), Timothy Holmes, F.R.C.S., and Charles Hawkins, F.R.C.S.

In my own practice, I have erected four large parish infirmaries, holding in the aggregate upwards of 2,500 ordinary sick patients, with less than 950 cubic feet of space to each, and the medical officers of these establishments have not found it necessary at any time to order the removal of any of the beds (as was contemplated), should one or more extraordinarily severe cases at any time be developed, and seem to call for increased space.

The Moabit Hospital at Berlin gives a space of only 864 cubic feet for each ordinary patient; but in this building one-fourth of the cases treated are stated to be of an acutely infectious character,* and we may presume that a larger space would be allotted for this class of patient.

† A paper by Mr. H. Saxon Snell, F.R.I.B.A., read at the Congress of the Sanitary Institute of Great Britain, held at Leicester.

* Notes on Hospitals, by Florence Nightingale. 1863.

* Hospital Construction and Management. London. 1883.

Yet the death-rate at this establishment, I am assured by eminent men who have examined the returns, is not above the average of other German hospitals.

The proper size of hospital-wards is not, however, to be determined by mere considerations of the greater or less quantity of air-space requisite for the well-being of a patient, for Dr. de Chaumont, in his report before referred to, has clearly shown that where, by good ventilation, a proper change of atmosphere is constantly effected, it matters not, within reasonable limits, what is the size of the ward. The question must be decided principally by consideration of floor-space, and here, again, examples and opinions are sadly diverse.

The Moabit Hospital, and the four parish infirmaries previously alluded to, contain about 70 superficial feet of floor-space per ordinary patient, and this is the quantity recommended by the before-mentioned committee of experts.

Capt. Douglas Galton asks for from 90 ft. to 112 ft., Miss Nightingale from 100 ft. to 104 ft., and Dr. Parkes and Dr. de Chaumont, from 100 ft. to 120 ft. In each case these authorities seem to determine their maximum and minimum by the question of whether or no accommodation is to be provided around the bed for students, *i.e.*, whether the hospital is or is not to be designed for a medical school.

The disposition of the superficial space determined upon, whatever it may be, involves two important questions, viz., the width of the ward, and the distance apart of the beds. Twenty-four feet is conceded to be, for all purposes of administration, an all-sufficient width for any hospital ward, and, inasmuch as it is of the highest importance that each bed should have the largest possible space surrounding it, this width would, I apprehend, never be exceeded, were it not for the desirability of reducing the length of a ward to within a limit not exceeding 120 ft.

In parish infirmaries the prescribed distance apart of the beds, *i.e.*, the bed-space, is 6 ft.; but 7 ft. 6 in. or 8 ft. is the width more generally adopted; and hence it comes about that the breadth of the wards is necessarily increased in some buildings to as much as 30 ft. And here I would point out that the advocates of the circular ward system invariably and wrongly use the term "wall-space" as synonymous with "bed-space," or the distance apart from centre to centre of the beds, and they often improperly calculate this distance a part of the beds, by dividing the total length of the circumference of the circle by the number of beds, and so arrive at a deceptive result.

Take, for example, the description given in the *Builder*, of May 9th last, of "A projected Military Hospital," designed upon the circular system. It is there stated that the wards are each to be 66 ft. internal diameter, and that they are to hold twenty-six patients: thus (says the description) "each patient will have a wall-space of 8 ft."

As a matter of fact, if this military hospital is ever erected, and twenty-six patients crowded into its wards, each will have a lineal wall-space at the head of his bed of 7 ft. 4 in., but the corresponding distance at the bottom of the beds will be but 6 ft. 3 in.,—that is to say (the beds being 3 ft. wide), the distance apart of them will be 3 ft. 3 in. only; and, therefore, if it is required to know what really will be the space given per bed in this proposed hospital, as compared with the quadrangular plan of ward, we must calculate the average distances apart as given above the beds at the heads and at the feet, and then, instead of the delusive 8 ft. of wall-space, we shall find that the actual *bed-space* per patient in this proposed hospital would only be 6 ft. 9½ in.

The above results would be arrived at by deducting 6 ft. 6 in. in width for each of the entrance lobbies, and then planning out the feet of the beds at an equal distance apart, and radiating them towards the centre of the circle.

Then, with regard to the height of hospital wards. It is only Professor Chaumont who expresses any decided opinion on this point, and the conclusion he arrives at, that 12 ft., or at most 13 ft., is all-sufficient, has since been confirmed by the results of experiments made by two eminent American physicians, Drs. Cowles and Wood,* who proved to their satisfaction that no benefit arises from making wards higher than 12 ft.. It is also, no doubt, upon these conclusions that the recommendations of the cubic space committee before referred to were based.

Most other authorities regard the question of height as quite subsidiary to that of floor-space, as decided by considering the width of the ward and the distance apart from centre to centre of the beds.

I have been particular in citing the opinions of these great authorities as to the requisite dimensions of ordinary wards, because I am about to show that it is practically impossible to design a circular hospital ward within the limits they have laid down without causing a useless multiplication of wards, ward offices, nurses, and domestics, resulting in an enormous and wasteful outlay, first in the erection of the buildings, and for all time in the annual establishment charges; and my argument would therefore admit of contention if it could be shown that in the illustration I am about to give I exceeded these limits, for it will be seen hereafter that the smaller we take the units of space the greater will be the cost of the circular as compared with the parallelogram-shaped ward; and I therefore propose to take for illustration a ward of dimensions which shall approach, as nearly as possible, the maximum quantities asked for by the before-mentioned experts.

A parallelogram-shaped ward (see fig. 2), containing thirty beds, and being 28 ft. wide, 120 ft. long, and 14 ft. high, will contain 1,568 cubic feet, and 112 ft. of floor area per patient, whilst the bed space will be 8 lineal feet per patient.

Fig. 1.

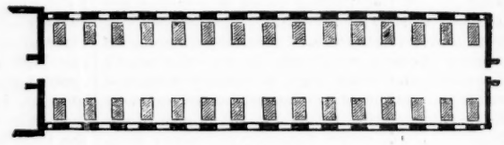


Fig. 2.

A circular ward (see fig. 1) of equal superficial floor space would be 65 ft. 6 in. in diameter, and if it is required (as for proper comparison it must be) to keep the beds the same distance apart as in the parallelogram-shaped ward, this space would not contain so many even as twenty-two beds. For, if we consider the feet of the beds to be 7 ft. distant from the outer wall (6 ft. 6 in. for the length of a bed, and 6 in. space between it and the wall), and the width of the two lobbies as 13 ft., we find that if there are twenty-two beds the lateral distance from centre to centre of the feet of each is 6 ft. 9 in., and the corresponding distance between the heads 8 ft. 8 in., thus giving an average distance of 7 ft. 8 in. only as against the 8 ft. space of the parallelogram-shaped ward. The result is that by the adoption of the circular plan we should have a ward containing less bed space, and, in round numbers respectively 41 superficial and 571 cubic feet per bed more than we started by admitting was necessary for the healthy condition of patients.

The dotted line upon the plan (fig. 1) encloses the centre space thus wasted in each ward amounting respectively to 896 superficial and 12,553 cubic feet.

Various ingenious suggestions have been made for the disposal of part of this space. One proposes to erect a staircase which, according to his plan, would occupy 250 superficial feet out of the 896, and at the Antwerp Hospital, a still less quantity is enclosed to form a room (ostensibly, but never, I believe, in reality) for the use of a nurse. But besides the practical inutility of adopting these expedients, it will be seen that any such obstruction would only augment the difficulties of cross ventilation already created by the necessity of having the windows between 60 ft. and 70 ft. apart.*

What, then, is to be done with this superfluous space? It has to be built, to be kept clean, to be ventilated, to be heated; but, worst of all, it has to be paid for; and at what cost I will now consider.

The two additional pavilions previously shown to be necessary would cost, including heating, lifts, and gasfittings, 26,800*l.*, and the outlay for the additional accommodation of twelve nurses, including furniture and accessories, would amount to about 700*l.*, or together to 27,500*l.* It will be observed that I have not taken into account the fact that the six remaining wards being built upon the circular system must of necessity be of more costly construction than if they were built up on the parallelogram principle.

This sum of 27,500*l.* represents the additional cost for 576 beds, and is at the rate of 47,743*l.* per 1,000 patients. Adding to this the capitalised cost of nursing these 1,000 patients, previously shown to amount to 57,392*l.*, we find that if the circular system is to come into vogue, we must be prepared for indulgence in the luxury (if it is one) at the rate of 105,135*l.* for every 1,000 patients.

Should it suggest itself to any one to inquire how a circular would compare with a parallelogram-shaped ward if both were designed to contain thirty beds, an average distance of 8 ft. apart, it would be found that the circular ward must be 87 ft. 9 in. diameter, and consequently the waste or unnecessary space in the centre of it would amount to no less than 2,705 superficial feet. Moreover, it would be evident that the height of such a ward must be raised considerably if any sunlight at all is to approach the centre of it, and supposing this additional height to be, say 3 ft., the quantity of waste or unnecessary space in one ward alone would amount to 64,180 cubic feet. But this is not all, for it would follow that the adjoining offices, separation wards, nurses' room, staircase, &c., must also be raised.

It will hardly be necessary, I think, to trouble you with the figures which would show the additional cost of this plan to be even greater than has been proved to result from a comparison of two wards of equal area, but with fewer beds in the one of circular shape. Neither need I point out to you how much all the other difficulties in regard to ventilation, lighting, heating, and want of cheerfulness would be enhanced.

Advocates of the system, however, say, "we have nothing to do with the cost; what we desire is to erect that description of building, whatever it may be, which best adapts itself to the cure of the patients to be contained in it"; and within reasonable limit this view of the question is no doubt a right one.

But I have searched in vain for any substantial arguments showing that from this point of view the circular is any improvement upon the parallelogram shape of ward, and I have little doubt that no such arguments could exist unless it can be shown that in contravention of Nature's laws air would as freely pass through a room from one side to another when the windows are 60 ft. or 70 ft. apart, as it would if those windows were from 24 ft. to 30 ft. apart. It would also have to be demonstrated that, in defiance of all mathematical rules, when the sun was shining, or the wind blowing, against the straight wall of a parallelogram-shaped ward, less air and sun would penetrate through its window-openings than would penetrate an *equal* number of window-openings of the same size contained in the wall of a circular ward. And then, having proved this anomaly, it would be necessary to define the process by which as large a quantity of air and sun could be brought into the circular ward through its twenty-two windows as could be brought in through the thirty-four windows of the parallelogram-shaped ward.

This being made evident, the contention must be upheld that a ward having the distance of its parts from the windows varying from 1 ft. to 33 ft., is as cheerful as one the parts of which

* Report of the State Board of Health of Massachusetts, 1879.

* We pointed out the absurdity of this proposed use of the centre space long ago, in regard to the published plans of this hospital.—ED.

vary similarly from 1 ft. to 14 ft. only. And it must be shown that this cheerfulness will not be diminished by the height of the circular ward being one-fifth only of its diameter, as compared with the parallelogram-shaped ward, the height of which would be one-half its width.

But, supposing all these difficulties to be surmounted, it will only have been shown that, in the points referred to, the circular is as good as the parallelogram system, and then what is left to compensate for the 105,000*l.* outlay before referred to?

It cannot be contended that, for the purposes of a medical school, where it is desirable the greatest space for students shall be given round and about the patient, the constriction of the feet of the beds, consequent upon their radiation towards the centre of the circle, is an advantage. It cannot surely be argued that it is a desirable arrangement to place a nurse (as at the Antwerp Hospital) in the centre of a sick ward, breathing all day its more or less foul atmosphere, rather than that she should be assigned an adjoining room, having a window through which she could overlook the patients. Neither can it be said that, if this central space is occupied by a staircase, such staircase would not be better placed (as in the parallelogram system) away from the ward and adjoining and giving direct access to the nurses' rooms, separation wards, and other offices, and so avoiding the necessity of all persons and things passing through and disturbing the occupants of the large ward.

And if, then, these deviations from past practice cannot be shown to be improvements, what is left for those who would still be admirers of the new system to put forward as a claim for its superiority over the old one? I cannot say, neither can I imagine.

TEMPLE BAR.

THE statement which we quoted from the *Metropolitan* three weeks ago, that Temple Bar was to "re-appear in all its old historic and archæological proportions" (!) at the Albert Palace, Battersea, was, with much show of authority and superior knowledge, flatly contradicted by the *City Press* at the time. Nevertheless, the first-named journal seems to have been better informed on the subject than the recognised organ of information with regard to civic matters, for, at the meeting of the Court of Common Council on the 17th inst., Mr. Dresser Rogers, chairman of the City Lands Committee, presented a report on behalf of that committee, recommending that the several portions of Temple Bar, now lying near Farringdon-street, should be given to the Albert Palace Company for the purpose of being erected in Battersea Park or on the confines thereof, the cost of the removal and reconstruction being defrayed by the company, and the Committee exercising such supervision and requiring such a guarantee for the erection of the same in a satisfactory manner as they may consider necessary. We are glad to see (and especially now that the Albert Palace is "in Chancery") that this absurd proposal was not adopted with the alacrity that its proposers could have wished. Mr. Manners very properly pointed out that it did not appear from the report whether they were giving the stones of old Temple Bar to Battersea Park or to a Company. If only to the latter, he should very strongly oppose the idea, and, in order that the information might be supplied, he moved the adjournment of the consideration of the report, which was accordingly adjourned.

We quote from the *Times* the following protest against the carrying-out of the ridiculous proposal of the City Lands Committee:—

"As the destination of Temple Bar could not be decided in a single debate, we will venture to urge our protest against the proposal, which is being seriously made by some members of the Court, to set it up as a kind of portico to the Albert Palace in Battersea Park. Nothing more incongruous could well be devised. Surely the Corporation has done injury enough to the fine old relic by putting up the Griffin in its place, without for ever condemning it to become the ornament to a speculative place of public entertainment. The right place for Temple Bar to end its days is amid the quiet and relative solitude of the Temple Gardens; and we had fondly hoped that this arrangement, so natural and obvious, had been already agreed upon."

Why not (as was suggested in the *Builder* a few months ago) utilise the old gateway as an entrance to the Temple from Temple-street, in lieu of the ramshackle wooden gateway which now does duty there? The improvements now being effected just outside this part of the Temple would seem to give opportunity for this being done by co-operation between the Corporation and the Benchers of the Temple.

AWARDS AT THE ANTWERP EXHIBITION.

THE following are among the awards granted to British exhibitors in the Industrial and Manufacturing sections of the Antwerp International Exhibition:—

Diplomas of Honour.—West Central Sanitary Company, London; Otto Gas Engine Company (Crossley Brothers), Manchester; St. John's Ambulance Association, London.

Gold Medals.—F. C. Calvert & Co., Manchester; H. C. Stephens, London; P. A. Maignen, London; Glenboig Union Fireclay Company (Limited), Glasgow; R. Hornsby & Co., Grantham.

Silver Medals.—Nettlefolds (Limited), Birmingham; Ed. Brooke & Co., Huddersfield; P. L. Simmonds, London; R. Renton Gibbs, Liverpool; Thomas Heron, London; Musgrave & Co. (Limited), Belfast; Saxby & Farmer, London; Wake & Dean, London; Revolving Ball Filter Company (Limited), London; Ipsen Terra-cotta and Fine Art Pottery, London; Ed. Smith & Co., Coalville; T. Bradford & Co., Manchester; Oakeley Slate Quarries Company, Portmadoc; W. Smeaton, London.

Bronze Medals.—E. Smith & Co., Coalville; North British Rubber Co., Edinburgh; Glenboig Union Fire Clay Co., Limited, Glasgow; Scott, Cuthbertson, & Co., London; George Farmiloe & Sons, London; Archibald Smith & Stevens, London.

Honourable Mention.—George Wright & Co., London.

In the Fine Arts section, the following awards have been made:—

Sir F. Leighton, Diploma of Honour.
G. F. Watts, 1st Class Medal.
Philip R. Morris, 3rd Class Medal.
H. Moore, Honourable Mention.
H. Thornycroft, 2nd Class Medal for Sculpture.

ALLEGED "SHORT" QUANTITIES.

THOMPSON *v.* GETHING.

THIS action, which was brought by Mr. Richard James Thompson, builder, of Kidderminster, against Mr. Josiah Morris Gething, architect, of Kidderminster and Stourbridge, and set down for hearing at the Birmingham February Assizes, was referred to Mr. E. R. C. Kettle, of the Oxford Circuit, with Mr. Yeoville Thomason, architect, of Birmingham, as his assessor.

The action was brought to recover 280*l.* 19s. 5d., amount of damages alleged to have been sustained by the plaintiff in consequence of defendant's negligence and want of care and skill in not taking out the quantities carefully for the building of the Lea-street Board Schools, and for extras, knowingly and wilfully disallowed by defendant as architect to the Kidderminster School Board. The plaintiff sent in a claim against the School Board for about 290*l.*, of which the defendant certified for 93*l.*, and refused to reconsider his certificate. Plaintiff issued a writ claiming the whole amount from defendant, and refused to present his certificate for payment by the School Board.

Sittings were held by the arbitrator at Kidderminster and Birmingham. Mr. Miller Corbet, of Kidderminster, conducted the case on the part of the plaintiff, and Mr. Thomas Horner, of Brierley Hill, for the defendant.

The plaintiff subsequently abandoned his claim for extras disallowed, and increased his claim for loss by quantities to 397*l.* 14s. 10s. A great mass of evidence and figures was gone into, the hearing occupying twelve days.

The arbitrator has now published his award, which finds that the plaintiff suffered no loss from the defendant's negligence and want of care and skill as quantity surveyor, and adjudges the plaintiff to pay defendant his costs of the action, and of the reference and award, including the costs of the assessor.—*Communicated.*

"THE TROCADÉRO."

SIR,—In your issue of last week [p. 412] you attribute the design of the Trocadéro Palace to M. Bourdais. If you allude to the building (now a museum) erected on the heights of the Trocadéro for the 1878 Exhibition, it was designed by the late M. Davioud. R. PHENÉ SPIERS.

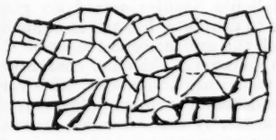
*** The paragraph alluded to by our correspondent was simply a quotation from the *Standard*, and printed as such.

FIREPROOF PACKING.

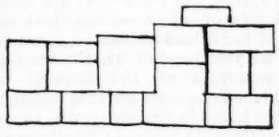
SIR,—Having a number of hot-air flues to insert between joists, I should feel greatly obliged if any of your readers could inform us of the best material to use for preventing any chance of firing the woodwork? The lighter the material the better for the work. H. G. F.

"RANDOM COURSES."

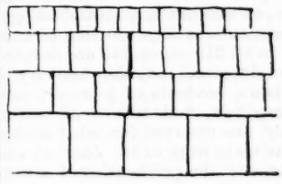
SIR,—It was stated in a contemporary that to a Congregational Church at South Woodford, "externally the whole would be faced with Kentish rag stone, *squared in random courses.*" Will any of your readers kindly inform me to which of the following that description applies.



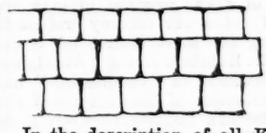
Random Work.



Drop Courses, sometimes described as Coursed Work.



Irregular Courses.



Regular Courses.

In the description of all Kentish rag stone work it should always be stated if with *rock face projecting*, or *hammer-dressed on surface*, also if pointed in *white* or *black* putty.

WILLIAM H. PIPE.

HOW TO KEEP LEAD GUTTERS FROM BEING BLOCKED BY SNOW.

SIR,—As the winter season is drawing on, allow me to describe, and to give the public the benefit of, a plan by which, for more than twenty years, I preserved my house from overflow by any fall or accumulation of snow in lead gutters. It is very simple, inexpensive, and most effective.

Place stools or forms on legs in the gutters. Let them be of such a height that their edges shall be lower than the eaves of the tiles or slates by about a quarter of an inch, and let them extend in width on each side (if the gutter be between two eaves) half an inch under the eaves. If the width of the gutter requires the top of the stool to be of more than one board, it will be as well that the boards be not too closely jointed that the drip may pass through. The snow will lodge upon the stools, and, as it thaws, the water will trickle down from the roof under the snow and over their edges, and find a clear course beneath them. This plan renders altogether unnecessary any clearing by shovel or otherwise, which is most undesirable and often mischievous.

If the gutter be behind a parapet, let the stool on one side touch the inner wall of the parapet.

The stools are best housed in summer and autumn, but this is not necessary if they be kept clear of leaves and nests, and be strong enough to bear the weight of a man or boy. J. G.

REINDEER INN, BANBURY.

SIR,—Referring to the drawing of the panelled room in the Reindeer Inn, Banbury, it may interest your readers to know that the present proprietor showed the members of the excursion a photograph from a painting of "A Roundhead Council of War," the apartment in which the council took place being a very faithful reproduction of the room. He stated that the figures were drawn by Mr. Orchardson.

Do any of your readers know of such a painting, or where photographs of it can be obtained?

JOHN L. ROBINSON.

WROUGHT-IRON CHIMNEYS.

SIR,—A short time ago a friend wrote me from Spain asking for information similar to that sought by your correspondent in last week's issue.

I was enabled to oblige through seeing an advertisement in the *Builder* of a book on "Tall Chimney Construction," which I obtained from Messrs. Spon, of the Strand, and sent out to my friend.

There are descriptions in this work of five wrought-iron shafts, and an elevation and section is given of one built in America.

Perhaps this will assist "O. F." in his inquiries.

J. BERNADO.

Books.

The American Journal of Archæology and of the History of the Fine Arts. Vol. I., Nos. 2 and 3. London: Trübner & Co. Baltimore. July, 1885.

SOME time ago we suggested that our own Journal of Hellenic studies would do good work if it were to devote a few pages annually to a summary of the archæological news of the year, and to an epitome of the chief contents of European archæological publications. This very useful task is undertaken, and, we think, carried out almost to excess, by the American Journal, the first number of which we had occasion to welcome in the spring, and the second and third simultaneous issues of which we have just received. Spite of her school at Athens, in which matter she is as yet ahead of us, the slender archæological resources at the disposal of America and her scholars are obvious enough. In a volume that takes in (to our regret, as we have said before) the wide fields of Christian and early American, as well as Classical archæology, we have the most curious disproportion of contents. Out of in all 212 pages, 145 are devoted to the task we advocated, *i.e.*, the summary of archæological news, contents of journals, proceedings of meetings, and review of books, sixty-seven only are reserved for, what should be, after all the main work of the Journal, *i.e.*, original articles and the publication of monuments. Some of these original articles are mere jottings of notes, nor do they profess to be more. Among the most interesting is the first article by Mr. Henshaw on the "Aboriginal Relics called 'Sinkers' or 'Plummets,'" but which, from examination of the customs of the modern Santa Barbara Indians, turn out to be "medicine stones" employed for all manner of odd magical purposes. This method of elucidating ancient remains by the custom of the modern savage is, since Mr. Lang became its eloquent apostle, and,—we may almost say,—founder, as fashionable as it is reasonable. Christian remains are represented by an article on "The Lost Mosaics of Ravenna" and another on the "Abbey of Jumièges." The most valuable contribution to classical archæology comes from England; Mr. Ramsey contributes a paper on "Notes and Inscriptions in Asia Minor." We notice specially an interesting inscription relating to the Association of Worshippers of Ganymede (Ganymedeitai) at Smyrna; little is known of the society, but from the patron's functions we fear its distinguishing characteristic may not have been total abstinence. Another inscription refers to an ancient guild of porters (φορτῆγοι). If porters were as pleasant and serviceable a class of old as now we should be glad to know more of their confraternity. Mr. Alfred Emerson discusses "two modern antiques." One of them, a bas-relief, once in Verona and published by Heydemann scarcely needed comment. It is true that Ottfried Müller and E. Braun, and, following them, Heydemann himself, accepted it as classical work, but the thing is too obviously modern and sensational, the whole conception as well as treatment too obviously non-classical to need discussion. A note to record the mistake would have been valuable, but to reproduce the plate and discuss it at length is waste of time and space. More interest attaches to the second supposed modern antique, the somewhat famous Herakles drawing the Bow, of the Carapanos collection. It has been universally accepted as classical. We cannot give in our adhesion to Mr. Emerson's new view without examining the original. (We may note in passing that the Carapanos collection, famous for its fine bronzes, is now, by the kindness of its owner, open to the public at Athens). The bronze in question is well known from the admirable heliogravure in M. Rayet's "Monumens de l'Art Antique," and, again we will ask why reproduce it instead of making simple reference to a book accessible to any archæologist? A note follows on Dörpfeld's "Restoration of the Propylæa," which we have already noticed in detail. It is, perhaps, excusable at the other side of the water that there should be a certain "backwardness" in the news. Mr. Goodyear's account of the Charvet collection of ancient glass now in the Metropolitan Museum, New York, is based avowedly on Froehner's "La Verrerie Antique." Among the "correspondence" is a valuable letter from M. Ernst Babélon on Punic archæology; no one speaks with more authority on this point than M. Babélon, who has just returned from a systematic exploration of the ruins of Carthage.

We pass to the larger and more important half of the book, the archæological summary. Here we can afford almost unqualified praise; occasionally, as in the matter of the "Mycenæ Sword-blades," we have a touch of the aforementioned "backwardness," but as a whole the result is invaluable. No English reading scholar need now complain that the field of archæology is too wide for at least a survey. News that before was obscured by the medium of Italian modern Greek or technical German is now plainly Englished, and the property of the laity. Details we need not note, as nearly every item of news has appeared from time to time in the pages of the *Builder*.

Gas Engines. By WILLIAM MACGREGOR. London: Symons & Co.

GAS engines have during the last few years advanced rapidly in public favour, and where small powers only are required their economic advantages have been fully recognised. The literature of the gas engine is, however, so far extremely scanty; in fact, the book before us claims the honour of being the first English work on the subject; but we trust that at some future time the author will use this book as a foundation on which to build another and a better one. The author commences with the early history of the gas engine, gathered chiefly from the various patent specifications, and dating from the powder-exploding machine of Abbé Hautefeuille, in the year 1678, and he traces the various developments of the engine up to the present day. This part of the book should be useful for reference.

Chapter II. treats on gas engines working with compression, and illustrations showing the arrangement of Otto's engine are attached. This is followed by some matter translated from the German, and gives the opinions of Slaby and Wedding as to how the gradual or supposed after-combustion of the mixture takes place after the charge which gives the impulse to the piston has been fired. The author's notes as to fixing and working the engine should be useful.

Further on the author compares the relative economy of gas, steam, and hot-air engines, but he very wisely confines the size of his gas engine to 8-h.p., as above that power there is little doubt the comparison would ascend very rapidly in favour of the steam engine. The author says the consumption of coal per effective horse-power per hour by small steam engines is about 7 lb. We should be glad of further details here as to what type of engine and boiler the author refers to, the statement being much too general.

Clerk's engine, which receives an impulse every revolution, is clearly described and illustrated, and other engines of the same type, including those by Turner, Atkinson, Robson, Maxim, and Siemens, are briefly noticed. The remainder of the book treats on the theory of the gas-engine, and contains a number of more or less reliable figures and statements collected and translated from various sources, with certain remarks and deductions by the author. Chapter VIII. is an able one, for which the author is indebted to Mr. Dugald Clerk. It treats on pressure, gas mixtures, combustion, and the general theory of the gas-engine.

RECENT PATENTS.

ABSTRACTS OF SPECIFICATIONS.

6,920, Portable Structures for Field Hospitals, &c. C. D. Abel.

Arched bars of H section spring from a sill running round the bottom of the structure, and are fixed at their upper ends to a ridge bar. At about half their height they are tied together by an angle-iron rib. The covering fabric rests on a wooden beam over the ridge-bar, and its bottom edge may be fastened to the sill by tent-pegs, or be extended outwards, and supported to form a verandah. A lining is attached by S hooks and cords to the bar, so that the enclosed air-space may be varied as required. Sheet metal, &c., or linoleum, may be used for covering.

7,946, Ventilating and other Flues. H. Talbot.

Special bricks are made, with which flues may be built, even in thin walls, without showing any projection from the wall. For vertical flues, holes are made through the bricks near one end, so that by alternating the position of the bricks the holes form a continuous flue, still preserving the bond of the brickwork. In thick walls, where larger flues are required, the bricks are of an irregular shape, pieces being cut from the corners. Horizontal and inclined flues are made in a similar manner to vertical flues, and special blocks are made for the junction of flues, and or to provide inlets from rooms. Flues opening into the lower part of rooms may be connected with spaces behind the fire-grates, and thus warm air may be supplied. The entering air in summer may be passed, if desired, over water or ice to cool the same.

9,003, Securing Thatch, Fences, and Trellis-work. T. B. Burns.

The appliance is made of galvanised or other wire, in the form of a net, the loops of which are of square or other shape, and joined to each other by crooks so as to form a secure and flexible joint. The arrangement may be applied for fencing, or as trellis-work, &c.

10,198, Furnace. T. R. Crampton.

The bed of the furnace is formed of slag, sand, or such like material, the sides or top, or both, forming part of a steam-boiler. Upon the bed streams of air and powdered fuel are directed, so that steel or other metal may be melted upon it.

10,299, Ventilating Drains, &c. A. G. Rumley.

To prevent the passage of sewer-gas into buildings, the soil, drain, and sewer pipes are fitted at intervals with normally closed valves, which open in the direction of flow. Ventilation is effected by forcing air in at points along the course.

10,295, Stained Glass. W. R. Pullen.

White or coloured "crystalline" glass is used as a groundwork, on which is produced any design in stained or coloured crystalline or other glass. Lead work is imitated by stamped outlines in paper, cardboard, or the like, which may afterwards be silvered, gilded, or coloured.

APPLICATIONS FOR LETTERS PATENT.

Sept. 11.—10,760, G. Garson, Suspension Bridges.—10,761, C. Smith, Facing Tiles or Plates for Concrete Connexions.—10,772, J. Johnson, Construction of Cowls.

Sept. 12.—10,802, S. Adams, Improvements in Flushing Syphons.—10,811, J. Hatch, Construction of Purlins for Glazing Purposes.—10,813, W. and G. Barker, Improved Mantelpiece, Chimneypiece, and Overmantel.—10,819, W. Brownlie, Burglar Alarms.—10,840, L. Mensing, Locks and Latches.

Sept. 14.—10,860, H. Sulley, Improved Spring Locks.—10,861, J. Macleish, Improvement in the Bramah Water-closet fitted with a Metallic Ground Valve.—10,863, R. Oates, Water Waste-Preventer Cistern for Water-closets.—10,880, W. Barlow, Improvements in Cooking Stoves.—10,882, H. Leigh, Improvements in Pile Drivers.—10,884, J. Welch, Manufacture of Bricks, Tiles, Pipes, &c.—10,886, W. Wilkinson, Construction of Footpaths, Roadways, and other Floorings or Pavings.—10,895, W. Johnson, Construction of Silos.

Sept. 15.—10,905, C. Fellows, Sustaining Window Sashes and Shutters without the aid of Sash Weights.—10,915, H. Hartung, Improvements in Door Checks.—10,928, A. Common, Improved Water-closet.—10,934, R. Stone, Manufacture of Cement.

Sept. 16.—10,960, D. Law and Others, Fastenings for Rain Water and other Pipes, &c.—10,982, G. Hookham and W. Tonks, Lines or Cords for Suspending Window Sashes, &c.—10,988, W. Wright, Mounting, Balancing, and Securing Window Sashes.—10,993, J. Still, Improvements in Locks.—11,001, W. Hassall, Composition for use in Jointing Stoneware, Concrete, or other Pipes.

PROVISIONAL SPECIFICATIONS ACCEPTED.

8,368, R. Roberts, File Guard for Sharpening Saws.—8,394, E. Chatham, Apparatus far Cutting or Dressing Stone.—8,409, C. Williams and H Stanton, Construction of Floorings of Bridges, Piers, and Buildings.—8,437, S. Ingham and Others, Woodworking Machinery.—8,483, D. Hall, Woodworking Machine for Staircases.—9,846, C. Thornett, Fastening Window Sashes when either shut or partially open.—9,877, J. Ellis, Casement Fastener.—9,954, R. Thomas, Improved Ball Cock.—15,932, W. Allday, Apparatus for Planing and Shaping Machines.—8,552, S. Ingham and Others, Woodworking Machinery.—9,822, A. Gamble, "Joiners' and other Bevels."—9,987, J. Costelle, Jointing or Coupling together Leaden Pipes.—10,000, H. Salsbury, Parallel Duplex Rulers.—10,091, C. Newton, Socketed Drain and other Pipes.—10,581, W. Tonks, Improved Letter Box.

COMPLETE SPECIFICATIONS ACCEPTED.

Open to opposition for two months.

14,974, T. Fraser, Domestic Fire Grates.—15,194, W. Gadd, Apparatus for Joining Lead Pipes.—15,454, A. Hutchison, Construction of Baths.—15,525, W. Lake, Water-closet Apparatus.—15,635, R. Chantry, Water-waste Preventer.—15,805, G. Buchanan, Ventilators.—4,419, W. Stein, Improvements in Bakers' Ovens.—9,584, J. Cartland, Door Springs.—9,707, A. Allan, Water Supply Apparatus for Water-closets.—9,732, D. Tennant, Syphon Water Traps.—15,014, J. Thompson and J. Bryant, Artificial Stone.—15,408, H. Haddan, Machinery for Sawing or Dressing Stone.—15,701, S. Goslin and J. Brown, Water-waste Preventer and Flushing Cistern.—9,716, B. Phillipson, Drains and Drainage Traps.

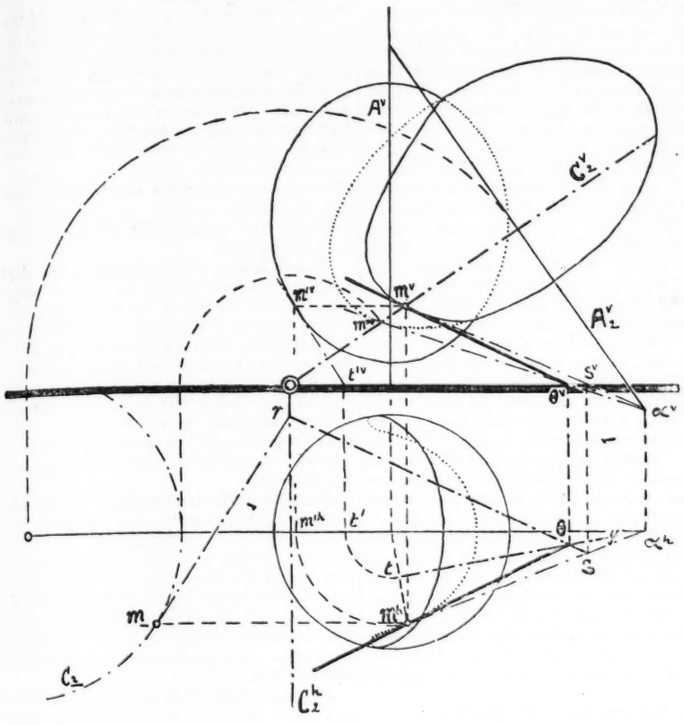


Fig. 167.

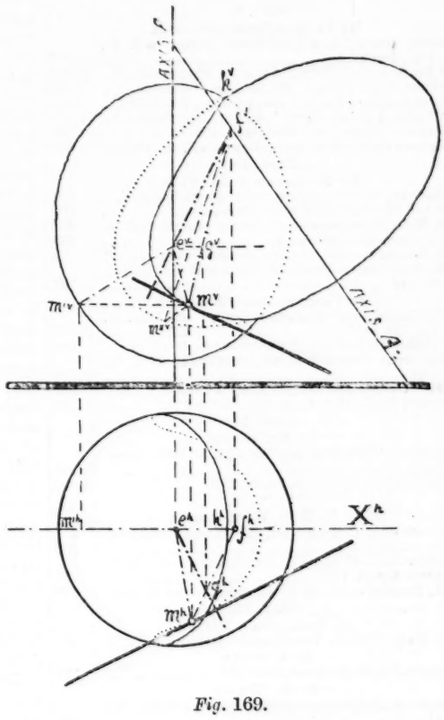


Fig. 169.

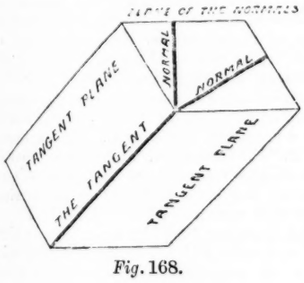


Fig. 168.

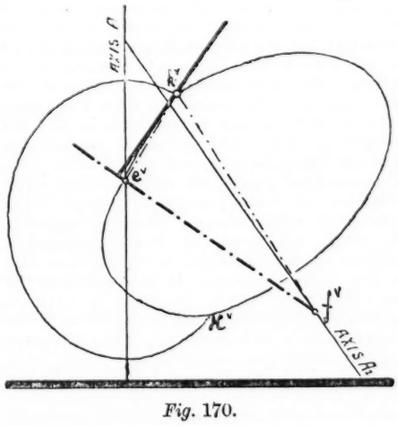


Fig. 170.

The Student's Column.

DESCRIPTIVE GEOMETRY.—PART II.

XVIII.

AS we have done in former problems, we shall find the tangent to the intersection in a point m of the same. We have said before that tangents assist us in drawing curves, but, for architects and builders, they have a far more practical importance, considering that the principal condition of good masonry is that the joints be normal to the inner surface of the vaults: this means that the joints be perpendicular to the planes tangent to the surface at any point of the joint.

To find the tangent in the point m to the intersection of the above surfaces of revolution, we may use the general method we have used for finding the tangent to the intersection of cones and cylinders; for the tangent to an intersection of two surfaces is always the intersection of the planes tangent to each surface in the same point.

Round the axis A (see fig. 167) we rotate the meridian on which the point m is situated until m come to m^1. After this rotation we can draw the plane tangent to the first surface, its vertical trace will be $m^{1v}\,t^{1v}$, and its horizontal trace will be the line which connects t^{1v} and t^1; when the point m is brought back to its original position, the horizontal trace of the tangent plane becomes the line $t\,y$. The next step is to find the horizontal trace of the plane tangent in the point m to the second surface of revolution. The tangent to the meridian of the second surface is a line belonging to the tangent plane, and to this tangent plane belongs also the tangent to the circle or parallel of the second surface on which the point m is situated; connecting the feet of these two tangents, we shall get the horizontal trace of the plane tangent to the second surface. Rotating the point m to m^{11} round the axis A_2 we can draw the tangent $m^{11}\,a$, which cuts the axis in the point a, and when the point m is brought back to its former position the tangent will still cut the axis in the same point, a; this allows us to draw the tangent $m\,a$, and mark its foot s. To find the foot of the tangent to the parallel, we have only to turn down the plane of that circle round its horizontal trace, C^h_2, then draw the circle and its tangent, the foot r of which will be on the horizontal trace, C^h_2. The trace of the plane tangent to the second surface of revolution is the line $r\,s$, the intersection θ of which with $t\,y$ trace of the first tangent plane gives us one point of the tangent required; m, of course, is another point, so the tangent to the intersection is the line $m\,\theta$, its elevation is $m^v\,\theta^v$, and its plan is $m^h\,\theta$.

We have now given the general method applied to these surfaces without any artifice special to this case, but there is a much more rapid method founded on the following consideration. We know that a line *normal* to a surface is perpendicular to the plane tangent to that surface. If at a point of the intersection of the surfaces we have the normal to each surface, it is evident that the tangent to the intersection in that point will be perpendicular to the plane which contains the two normals, as can be seen by the sketch below (see fig. 168). Let us also remind our readers that, when a line is perpendicular to a plane the projections of that line are perpendicular to the traces of the plane.

With surfaces of revolution normals are very easily drawn; for, if we produce a normal to the outline on the elevation (see fig. 169), say on the point m^{1v} the normal will go and cut the axis A in a point e, and when we rotate the point to any other position, say m, the normal will still go through the same point e: so that $e^v\,m^v$ is the elevation of the normal to the first surface, and $e^h\,m^h$ is its plan. Likewise we get the projections $f^v\,m^v$ and $f^h\,m^h$ of the normal to the second surface; and then we know that the plan of the tangent will go through m^h and be perpendicular to the horizontal trace of the plane which contains the lines $e\,m$ and $f\,m$, or, what is equivalent, the plan of the tangent will be perpendicular to $e^h\,g^h$ plan of a horizontal line of that plane. The elevation of the tangent will go through m^v and be perpendicular to $e^v\,f^v$, for this line is the intersection of the plane of the normals by the plane X parallel to the elevation plane, and therefore $e^v\,f^v$ are parallel to the vertical trace of the plane which contains the normals.

In short, this method of finding the tangent to the intersection consists in drawing the normals $e\,m$ and $f\,m$, producing the horizontal $e\,g$, and drawing the tangent through m, the plan perpendicular to $e^h\,g^h$, the elevation perpendicular to $e^v\,f^v$. This method is not only more rapid than the general method of the tangent planes, but it offers the advantage to be applicable to certain points, where the other method would fail.

In the point k the tangent to the curve of intersection is perpendicular to the vertical plane of projection; the tangent is, therefore, projected in a point and cannot assist us in drawing the curve of intersection on the elevation. What we want is a tangent to the elevation of the intersection considered as a curve contained in a vertical plane. We have seen (fig. 169) that the tangent on elevation is perpendicular to $e^v\,f^v$, and that this occurs for any point m; we conclude, therefore, that it will also apply to the point k. We draw for k the normals $k^v\,e^v$ and $k^v\,f^v$; join $e^v\,f^v$ and make the tangent perpendicular to that line (see fig. 170). We can consider that tangent as the projection of a tangent in a point infinitely near to k. On account of the symmetrical arrangement of the drawing, it can be very easily proved by algebraical calculation that the vertical projection of the curve of intersection is in our case a curve of the second degree, either a portion of an ellipsis, a parabola, or a hyperbola. We have made a similar observation when treating of the intersection of two cones, for we shall find these useful in delineating the intersections.

RECENT SALES OF PROPERTY.

ESTATE EXCHANGE REPORT.

SEPT. 8.

By VENTOM, BULL, & COOPER.

Kendal, near—"Low Underbrow Farm," 57a. 3r. 12p., freehold	£2,200
"Natland Hall Farm," 148a. 1r. 16p., freehold	10,880
"Crow Park Farm," 33a. 3r. 33p., freehold	2,525
"High House Farm," 44a. 1r. 37p., freehold	2,850
"Natland Abbey Farm," 46a. 0r. 35p., freehold	2,575
Several cottages, and moss land, 10a. 0r. 30p.	365
Various chief rents, amounting to 44*l*. 0s. 11d.	800

SEPT. 10.

By WORSFOLD & HAYWARD.

Dover—24, Albert-road, 80 years, ground-rent 2*l*.	305
48 and 52, Clarendon-street, freehold	380
10, Effingham-crescent, 41 years, ground-rent 1*l*.	480
4, Church-road, freehold	320
68, Snargate-street, 10 years, ground-rent 1*l*. 4s. 6d.	72
Folkestone, near—Freehold house and 15a. 1r. 4p., in lots	787

By VENTOM, BULL, & COOPER.

Kirby Lonsdale—"Casterton Hall," and 165a. 2r. 1p., freehold	17,500
"Casterton Old Hall" and grounds, freehold	750
Numerous freehold farms, containing 939a. 0r. 14p.	40,710
The "George and Dragon Inn," freehold	750
Several freehold cottages and gardens	1,530

SEPT. 14.

By Mr. WOODS.

Hounslow—"The Poplars," and 2a. 3r. 23p., freehold	1,525
Two freehold meadows, 2a. 2r. 16p.	1,000

SEPT. 16.

By H. S. WOODCOCK.

Battersea—55, Church-road, 67 years, ground-rent 5*l*.	175
Lavender-hill—65 and 67, Basnett-road, 84 years, ground-rent 10*l*.	420
141, Beaufoy-road, 83 years, ground-rent 5*l*.	210

SEPT. 17.

By PROCKTER & FRASER.

West Ham—"Belle Vue House," freehold	810

By A. BOOTH.

Plaistow—72, High-street, freehold	550

By D. YOUNG.

Brixton—6, Brighton-terrace, 25 years, ground-rent 4*l*.	175
Clapham-road—20, Binfield-road, 54 years, ground-rent 7*l*. 10s.	450

By C. C. & T. MOORE.

Bow-road—A plot of freehold land	265
Poplar—31, Woodstock-road, 58 years, ground-rent 4*l*. 15s.	320
Mile-end—15 and 18, Longfellow-road, freehold	745
Camden-town—197 and 199, Great College-street, 49 years, ground-rent 16*l*.	955
Walthamstow—2, St. George's-villas, 64 years, ground-rent 3*l*.	295

SEPT. 18.

By WESTON & SONS.

Camberwell—52, Paulet-road, 82 years, ground-rent 6*l*.	450
Knightsbridge—1 to 5, Pearcy's cottages, 10 years, ground-rent 30*l*.	380

Miscellanea.

Vicissitudes of a Sculptured Bull.—Some years ago Mr. C. T. Newton, Keeper of the Greek and Roman Antiquities in the British Museum, saw on the lawn of Hillingdon Court, near West Drayton, under a yew tree, and green with exposure, a recumbent bull of Pentelic marble, a work of the Athenian School, and dating (according to the *Times*) so far back as a period not later than the fifth century before the Christian era. It had been brought over from Athens, over sixty years ago, by the late Mr. Charles Robert Cockerell, the celebrated architect and antiquary, and is reproduced in a supplementary volume of the "Antiquities of Athens and other Places in Greece, Sicily, &c., 1830." "In landing it at London," says Professor Adolf Michaelis, in his description of the Ancient Marbles in Great Britain, 1882, "the sailors contrived to slip it into the Thames. The fishing it out cost so much that Cockerell declined to pay the freight. The bull then went to the London Custom-house, where it remained some years, till Mr. James Bandinel got hold of it. He sold or gave it to Mr. Mills, the owner of Hillingdon Court, near West Drayton. I am informed that the marble is still existing in that place, but to what extent, being exposed in the open air, it may have suffered from the destroying influences of the English climate I am unable to say." The bull in question has at length been presented by Sir Charles Mills to the trustees of the British Museum, and made its first appearance in the Elgin Room a few days ago. To its protracted bath in the Thames, alluded to by Dr. Michaelis, as well as to its exposure to the weather at Hillingdon Court, must be partially attributed the tokens of wear and decay, as occasioned by the beating, fall, and dripping of rain, and other distintegrating action of water. The figure is about 5 ft. 6 in. in length, and is in a recumbent position, on a rough-worked pedestal of a few inches deep.

A New Explosive: Gelatine-Dynamite. Mr. Nobel's latest creation, gelatine-dynamite, combines and gives effect to the powers and qualities of the two great explosives that go to form its name. It has gone little further than the test stage as yet; but the accounts that have reached us of its use in mines, limestone and granite quarries, tunnels and collieries, show that it has advantages which the intelligent workman appreciates; that it does the work of dynamite in places which cannot be well ventilated; and that it leaves so little of an offensive smell that miners can go in almost immediately, feel no bad effects, and get on with their work. If it can maintain this asserted excellence, then Mr. Nobel has added another to the advantages and benefits he has conferred upon the working miner. But that is not all. We know that in what are called fiery mines explosives that emit flame are attended with great risk; but here gelatine-dynamite claims to do the work of powder in coal mines, to get the coal well, and to go through the drift faults with speed, precision, and safety. It may or may not stand the test of experience in coal mines, as well as, or better, than our old friend powder, whose action in explosion it somewhat resembles. Doubtless this will be rigorously tested by scientific and practical men, and if it stands the test better, an additional protection to the lives of colliers will be available. Mr. Nobel claims to be able to make this gelatine-dynamite to suit the mildest work, and also to meet the surroundings of the most difficult Cornish, Welsh, and hematite mining. — *Mining Journal*.

Ceramic Decoration at Berlin. — The removal of Dr. Schliemann's collection of Trojan antiquities from the Berlin Museum of Industrial Art has permitted the completion of the decorative work in certain portions of the interior. The *Sprechsaal* calls attention to the terra-cotta work in connexion with four large doors, as well as the mural tiles in the immediate vicinity. This work is contributed by the Mettlach factory, and will in itself form an interesting permanent exhibit. The ornamentation of these portals is in hard white terra cotta, with coloured glazed decoration. The work (designed by Herr Schmieden, architect of the Museum, in conjunction with the late Herr Gropius), is characterised by that exactness which, in such a case, is absolutely indispensable, while the effect of the colours is rich and striking; the necessary harmony with the surroundings being duly regarded. This work, in conjunction with the Moorish Court in the Kaiserhalle, gives Berlin two of the most important existing specimens of modern decorative terra-cotta manufacture. Germany would seem to have hitherto been rather behind other nations in general adoption of this description of ornament, although the manufactures of that country have for some time past made it a subject of particular attention, and have brought it as far as possible under the notice of those interested.

Preservation of Wood. — The Vienna *Gewerbe Zeitung* alludes to the present extensive adoption of the Guido Ratgers process, by which all kinds of decomposition are arrested. Various Austrian and Hungarian railways have impregnated sleepers and building wood, according to this system, with the result that soft sleepers have lasted fourteen to fifteen years. Although the abundance of wood in Hungary has delayed general attention being given to the impregnation of wood for structural purposes, the application of this process at Buda-Pesth to wood-paving has been attended with results of an eminently satisfactory character. Wood has also, it is stated, been treated by an analogous process, with the result of its being rendered incombustible. Attention has been directed in a special manner to this process, by the samples of impregnated wood shown at the present Buda-Pesth exhibition.

Publications.—Messrs. Crosby Lockwood & Co. announce, among other practical works, for immediate publication:—"Land and Marine Surveying," by W. Davis Haskoll (new and revised edition); "Practical House Decoration," by J. W. Facey (Weale's Series); "The Metal Turner's Handbook," by P. N. Hasluck, being the first volume of a series of handy books on handicrafts; and "The Engineman's Companion," a practical educator for enginemen, boiler attendants, and mechanics, by Michael Reynolds.

Indicating Door-Fastener. — Messrs. Cross & Co. send us a specimen of their patent fastener, which indicates when a room is occupied, by the appearance of the word "engaged," on an outside circular boss, the word being covered ordinarily by a metal plate, turning on a centre. On bolting the door a rack on the bolt turns a small cog-wheel, which causes the metal covering to revolve on the centre, and leaves the word visible from outside. The circular action, *per* the cog-wheel, seems to be the distinctive quality of this patent. It is, perhaps, the neatest way of doing it, and the bolt works well.

Hotel Lifts.—The American Elevator Company have obtained the contract for supplying one of their standard hydraulic passenger elevators for the South Kensington Hotel, Queen's Gate-terrace, recently purchased by Mr. James Bailey, the proprietor of Bailey's Hotel. It is Mr. Bailey's intention to carry out the American idea of increasing the height of this hotel by adding another story to it, to make the upper stories equal in their appointments to the lower ones, and to ensure perfect access to the upper floors.

Amateur Photography.—We are informed that owing to the great success of the Amateur Photographic Exhibition, held in Bond-street last spring, the directors of the London Stereoscopic and Photographic Company have again secured the same galleries for April and May next, when it is anticipated a still more interesting series of photographs will be brought together. Any profits that are made will be devoted to a charitable object.

Plympton St. Mary.—The foundation-stone has been laid of a new vicarage-house for Plympton St. Mary, Devon. The house is to be built of limestone with red brick dressings, and will be in the Gothic style. Messrs. J. Rowell & Son, of Newton Abbot, are the architects; Mr. P. Blowey, Plymouth, the builder; and Mr. W. Shier, of Plympton St. Mary, the clerk of the works. The cost of the work will be 1,900*l*.

Bishop Stortford.—St. Michael's Church, Bishop Stortford, has been re-opened by the Bishop of St. Alban's. The chancel has undergone a thorough renovation. The architect was Mr. A. W. Blomfield, and it was principally through the liberality of Mr. J. L. Wigan that the work has been undertaken and carried out. It has cost upwards of 2,000*l*.

The Timber Supply Co.—This is the title of a company which has been started with the object of supplying timber for contractors' purposes, such as Baltic deals, battens, and prepared flooring, in convenient quantities for buyers, direct from the docks, at wholesale prices for cash. Probably this will be a convenience to some purchasers, the cost of cartage and yard expenses being saved to the buyer.

Sir J. Millais's Works.—Messrs. Virtue & Co. announce the publication in their "Art Annual" for this year of a series of engravings from the works of Sir John Millais, including "The Huguenots," "Chill October," "The North-west Passage," and other well-known paintings.

Charterhouse Science and Art Schools and Literary Institute.—The winter session of this, one of the largest science and art schools in the United Kingdom, will, under the presidency of the Rev. Henry Swann, M.A., commence on Saturday, October 3rd.

PRICES CURRENT OF MATERIALS.

TIMBER.	£. s. d.	£. s. d.
Greenheart, B.G. ....ton	6 10 0	7 10 0
Teak, E.I. ....load	12 10 0	15 10 0
Sequoia, U.S. ....ft. cube	0 2 6	0 2 9
Ash, Canada ....load	3 0 0	5 0 0
Birch ,, ...	3 0 0	4 10 0
Elm ,, ...	3 10 0	5 0 0
Fir, Dantsic, &c.	1 10 0	4 10 0
Oak ,, ...	3 0 0	5 0 0
Canada	6 0 0	7 0 0
Pine ,, red	3 0 0	4 0 0
,, yellow	3 15 0	5 5 0
Lath, Dantsic ....fathom	5 0 0	6 0 0
St. Petersburg	5 0 0	7 0 0
Wainscot, Riga....log	3 0 0	4 10 0
Deals, Finland, 2nd and 1st...std. 100	8 0 0	9 0 0
4th and 3rd	6 10 0	7 10 0
,, Riga	7 0 0	8 10 0
St. Petersburg, 1st yel.	10 0 0	17 0 0
,, 2nd ,, ...	8 0 0	9 15 0
,, white	6 10 0	11 0 0
Swedish....	7 0 0	17 0 0
White Sea	8 10 0	19 0 0
Canada, Pine 1st	18 0 0	32 10 0
,, 2nd	12 0 0	18 10 0
,, 3rd, &c.	7 0 0	10 10 0
,, Spruce 1st	9 0 0	12 0 0
,, 3rd and 2nd	6 10 0	8 0 0
New Brunswick, &c....	5 0 0	7 10 0
Battens, all kinds	4 0 0	13 0 0

TIMBER (*continued*).	£. s. d.	£. s. d.
Flooring Boards, sq. 1 in.—Prepared, first	0 9 0	0 13 0
Second	0 7 6	0 8 6
Other qualities	0 5 0	0 7 0
Cedar, Cuba.....foot	0 0 3½	0 0 4
Honduras, &c.	0 0 3	0 0 4
Australian	0 0 3	0 0 3½
Mahogany, Cuba	0 0 5	0 0 7½
St. Domingo cargo av.	0 0 5½	0 0 7½
Mexican ,,	0 0 4	0 0 5
Tobasco ,,	0 0 4	0 0 6½
Honduras ,,	0 0 4½	0 0 6½
Rose, Rio .....ton	7 0 0	17 0 0
Bahia	6 0 0	15 0 0
Satin, St. Domingo .....ft.	0 0 8	0 1 0
Porto Rico	0 0 8	0 1 3
Walnut, Italian	0 0 4	0 0 5
METALS.		
IRON—Pig in Scotland .....ton	2 1 6	0 0 0
Bar, Welsh, in London.....ton	4 15 0	5 2 6
,, in Wales	4 7 6	4 12 6
,, Staffordshire, London	6 0 0	7 0 0
Sheets, single, in London.....ton	7 10 0	9 0 0
Hoops ,,	6 10 0	7 10 0
Nail-rods ,,	6 0 0	7 0 0
COPPER—		
British, cke. and ingt. .....ton	45 0 0	46 0 0
Best selected	46 0 0	47 0 0
Sheets, strong	54 0 0	0 0 0
,, India	51 0 0	52 0 0
Australian, fine cash	0 0 0	0 0 0
Chili, bars ,,	41 5 0	42 0 0

METALS (*continued*).	£. s. d.	£. s. d.
YELLOW METAL.....lb.	0 0 4½	0 0 4½
LEAD—Pig, Spanish	11 5 0	0 0 0
English, com. brands	11 12 6	0 0 0
SPELTER—		
Silesian, special .....ton	14 10 0	14 12 6
Ordinary brands	14 7 6	14 10 0
TIN—		
Straits	90 10 0	91 0 0
Australian	90 10 0	91 2 6
English ingots	93 0 0	0 0 0
TINPLATES—		
IC coke .....box	14 6 0	16 6 0
IX ditto	21 0 0	25 0 0
IC charcoal	17 0 0	20 0 0
IX ditto	26 0 0	27 0 0
OILS.		
Linseed .....ton	22 17 6	23 10 0
Cocoanut, Cochin	31 10 0	32 0 0
Ceylon	27 0 0	0 0 0
Copra	26 0 0	26 10 0
Palm, Lagos	30 0 0	0 0 0
Palm-nut Kernel	28 0 0	0 0 0
Rapeseed, English pale	25 15 0	0 0 0
,, brown	23 0 0	0 0 0
Cottonseed, refined	21 5 0	23 0 0
Tallow and Oleine	25 0 0	45 0 0
Lubricating, U.S.	7 0 0	10 0 0
,, Refined	8 0 0	15 0 0
TURPENTINE—		
American, in cks. .....cwt.	1 5 0	1 5 6
TAR—Stockholm .....brl.	0 19 6	1 0 0
Archangel	0 11 0	0 11 6

COMPETITIONS, CONTRACTS, & PUBLIC APPOINTMENTS.

Epitome of Advertisements in this Number.

COMPETITIONS.

Nature of Work.	By whom required.	Premium.	Designs to be delivered.	Page.
Design for Public Abbatoirs	Birkenhead Corporation	Not stated	October 24th	ii.

CONTRACTS.

Nature of Work, or Materials.	By whom required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.	Page.
Painting Barracks, &c., Halifax	War Department	*Official*	Sept. 28th	ii.
Making-up Roads, &c.	Wandsworth Bd. of Wks	do.	Sept. 29th	xiii.
Painting Works, &c.	St. Saviour's Union, Surrey	Jarvis & Son	October 1st	ii.
Cottages, Roads, Drainage, &c.	Sheerness Permanent Benefit Building Soc.	*Official*	do.	ii.
Water Works, Highbridge	Axbridge R. S. A.	A. Woodhouse	October 4th	ii.
New Sewers and Alterations to existing Sewers	Holborn Board of Wks	Lewis H. Isaacs	October 5th	xiii.
Paving Bricks	Worthing Local Board	*Official*	do.	ii.
Kerbing, Tar-Paving, Metalling, &c.	Lewisham Brd. of Wks.	do.	October 6th	ii.
Caithness Flagging	Hove Commissioners	Ellice Clark	October 7th	ii.
Lamp-Posts	do.	do.	do.	ii.
Brick Sewer	Vestry of St. James's, Westminster	*Official*	October 8th	ii.
Drainage of Portion of Cemetery, Finchley	St. Mary, Islington, Burial Board	do.	October 12th	xiii.
Alterations, Post-Office, Portsea Hard	Com. of H.M. Works	do.	October 13th	ii.
Coals, Drain-Pipes, and Stores	Croydon Town Council	do.	do.	xiii.
Enlargement, Southampton Post-Office	Com. of H.M. Works	do.	October 14th	ii.
Wrought-Iron Vertical Bar Fencing, with Cast-Iron Standards, &c.	Blackburn Corporation	J. B. McCallum	do.	ii.
Concrete Sea-Wall and Promenade	Hartlepool Corporation	H. Mair	October 28th	ii.
Storage Reservoir	Cardiff Corporation	J. A. B. Williams	October 29th	ii.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary.	Applications to be in.	Page.
Engineering Draughtsman	Belfast Town Council	156*l.*	Sept. 30th	xviii.
Borough Surveyor	Bootle-cum Linacre Cor	300*l.*	October 13th	xviii.
County Surveyorship, Ireland	Civil Service Com.	Not stated	October 23rd	xviii.
Clerk of Works	Acton Local Board	2*l.* 10s. per week	Not stated	xviii.

TENDERS.

BECKENHAM.—For making up Upper Lennard-road and Parish-lane. Mr. Geo. B. Carlton, C.E., engineer and surveyor :—

Langridge, Croydon	£2,418 0 0
Inns & Wood, Birmingham	2,254 0 0
Brooker, Beckenham	2,117 0 0
H. Hill, High Wycombe	2,084 0 0
Botterill, London	1,962 0 0
R. Mayo, Brixton	1,857 0 0
J. S. B. Marshall, Brighton	1,841 0 0
John Mowlem & Co., London*	1,712 0 0

* Accepted.

CAMBRIDGE.—For new chaff barn, mixing shed, &c., at Little Wilbraham Farm, for Messrs. Foster. Mr. J. Carter Jonas, surveyor, Cambridge :—

Lofts	£252 8 6
G. Worboys	190 5 0
John Dawson (accepted)	145 10 0

DORSET.—For drains and other sanitary work at Chalmington House (exclusive of new wing, lodge, and stables). Mr. Mark H. Judge, architect and surveyor :—

Conway, Evershot (accepted)	£172 5 0

BRISTOL.—For erection of St. John's Parish Room, Bedminster, from plans and specification by Mr. A. J. Beavan. Quantities supplied by Mr. A. Barratt, surveyor, Somerset-chambers, Bristol, to all but the builder whose tender is marked "withdrawn" :—

Mason	£1,095 0 0
J. Mason	1,085 0 0
J. E. Davis	1,084 0 0
Eastabrook & Sons	1,080 0 0
T. R. Lewis	1,077 0 0
R. Wilkins & Sons	1,045 0 0
Tucker	1,035 0 0
J. Wilkins	1,022 0 0
H. J. Rossitter	1,000 0 0
W. Searle	990 10 0
W. Church	987 0 0
T. H. Brown	984 0 0
C. A. Hayes (accepted)	977 0 0
E. Manning (withdrawn)	756 0 0

COVENTRY.—For alteration and extension of the Sewage Purification and Disposal Works. Contract No. 1. Mr. J. C. Melliss, engineer :—

J. S. Halliwell	£6,400 0 0
John Miles	6,300 0 0
W. Boon	5,130 0 0
C. Garlick	4,5 0 0 0
W. H. Hughes & Co.	3,951 0 0
T. Mayo (accepted)	3,295 0 0
G. Punshon (withdrawn)	3,000 0 0

GUILDFORD.—For proposed additional wards, &c., at the Royal Surrey County Hospital. Mr. W. G. Lower, architect, Guildford :—

Thirty Beds.

J. Bottrill	£5,980 0 0
Carless & Co.	5,853 0 0
T. H. Kingerlee	5,810 0 0
Bell & Sons	5,733 0 0
S. Elliott	5,595 0 0
Potterton & Co.	5,526 0 0
Peat	5,508 0 0
Tompsett & Co.	5,502 0 0
G. Huckle	5,359 0 0
Johnstone & Co.	5,305 0 0
C. J. C. Pawley	5,192 9 3
W. Holt	5,190 0 0
P. Peters	5,078 0 0
J. Longley	5,015 0 0
Bull, Sons, & Co.	4,990 0 0
R. Nye	4,877 0 0
Woolgar & Sons	4,825 0 0
Martin, Wells, & Co.	4,789 0 0
Mitchell Bros.	4,738 0 0
Kirk Bros.	4,700 0 0
G. Walker	4,393 0 0

Twenty-four Beds.

J. Bottrill	5,590 0 0
Carless & Co.	5,483 0 0
T. H. Kingerlee	5,440 0 0
Bell & Sons	5,366 0 0
S. Elliott	5,244 0 0
Tompsett & Co.	5,190 0 0
R. Peat	5,180 0 0
Potterton & Co.	5,172 0 0
G. Huckle	4,993 0 0
W. Holt	4,890 0 0
Johnstone & Co.	4,875 0 0
C. J. C. Pawley	4,849 6 5
P. Peters	4,788 0 0
J. Longley	4,730 0 0
Bull & Sons	4,697 0 0
R. Nye	4,579 0 0
Woolgar & Sons	4,535 0 0
Martin, Wells, & Co.	4,499 0 0
Mitchell Bros.	4,449 0 0
Kirk Bros.	4,420 0 0
G. Walker	4,137 0 0

HORNSEY (Middlesex).—For new Wesleyan Chapel, Middle-lane, Hornsey. Mr. Elijah Hoole, architect :—

Williams & Son	£7,150 0 0
Dove Bros.	6,755 0 0
Smith & Sons	5,977 0 0
Lathey Bros.	5,900 0 0
MacFarlane Bros. (accepted)	5,478 0 0

HORNSEY (Middlesex).—For making up of carriageway of Granville-road, Stroud-green :—

W. T. Williamson, Green-lanes	£715 0 0
Marshall, Brighton	660 0 0
Aspinall & Son, Hoxton	660 0 0
Heard, Hoxton	610 0 0
Pizzey, Hornsey	608 0 0
Nicholls, Wood-green	592 0 0
Walker, Upper Holloway	549 0 0
Jackson & Sons, Densbury Park	521 0 0
Mowlem & Co., Westminster*	496 0 0

* Accepted.

HORNSEY (Middlesex).—For jeweller's shop-front and sundry repairs, at Stroud Green-road. Mr. W. Smith, Gresham-buildings, architect :—

Clarke Bros.	£136 0 0
Mattock Bros.	125 0 0
Dunford & Langham	118 0 0
J. O. Richardson	77 15 0

HORNSEY (Middlesex).—For shop-front at Crouch-end, for Mr. S. Sugden. Mr. W. Smith, architect :—

Clarke Bros.	£118 0 0
Lark & Son	110 0 0
Dunford & Langham	99 0 0

LEEK.—For partitions, furniture, and fixtures at Silk warehouse premises, for Messrs. Wardle & Davenport. Quantities supplied. Messrs. W. Sugden & Son, architects, Leek :—

Accepted Tenders.

E. Goodall & Co., Manchester	£244 4 6
Jas. Hudson, Leek	96 4 0
H. Stevenson, Leek	13 16 0
Micah Carding, Leek	69 5 0

LONDON.—For making certain alterations and additions to "The Carpenters' Arms," Dante-road, Newington Butts. Mr. H. I. Newton, architect, 17, Queen Anne's Gate :—

Lamble	£698 0 0
Burman & Son	685 0 0
Walker	679 0 0
Godden	675 0 0
Cook	670 0 0
Canning & Mullings (accepted)	547 0 0

LONDON.—For fittings at "The Havelock" public-house, Gray's Inn-road, Holborn, for Mr. James Bacon. Mr. Charles Young, architect, Rochester :—

Cabinet and Bar Fittings.

F. Sage & Co., Gray's Inn-road	£642 0 0
Joseph Higgs, Dorset-square	510 0 0
Drew & Cadman, High Holborn	500 0 0

Pewterers' Work.

Sanders & Sons, High Holborn	£156 10 0
Thomas Heath, Goswell-road	155 0 0
Buckley & Beach, Chelsea	152 10 0

LONDON.—For sundry cleaning and other works required to be performed in the Library at Guildhall, for the Corporation of the City of London, under the direction of Mr. Horace Jones, City Architect :—

Greenwood	£1,680 0 0
Harrison & Co.	1,627 0 0
G. Trollope & Sons	1,298 0 0
Phillips & Banks	1,289 0 0
C. Blyton	1,034 0 0
Colls	970 0 0
Lark & Son	970 0 0
Dove Bros. (accepted)	775 0 0

GLONDON.—For alterations and additions at "The riffin," Leonard-street, Finsbury, for Mr. O'Reilly. Messrs. Gardiner, Son, & Theobald, architects. No quantities :—

Boydon & Son	£1,600	0	0
Johnson & Matthews	1,355	0	0
Homer & Cutler	1,275	0	0
Drew & Cadman	1,237	0	0
J. Axford	1,225	0	0
Staines & Son, Great Eastern-street..	1,158	0	0

LONDON.—For works at 16, Ordnance-road, for Mr. J. Chaplin. Mr. Thos. Durrans, architect :—

Edgar	£174	0	0
Sheerman & Son	165	0	0
Bodimeade	145	0	0
Atkins	119	0	0
Brundell (accepted)	112	0	0

SOUTHGATE (Middlesex).—For alterations and additions to "Truro House," Southgate, for Mr. T. R. Roberts. Mr. J. Kingwell Cole, architect. Quantities by Mr. Pickersen. Messrs. Battam & Co., surveyors :—

E. J. Chant, Holloway	£727	0	0
L. & W. D. Patman, Enfield	687	0	0
Paine Bros., Stamford-hill	670	18	3
J. Pocock, Wood-green	627	0	0
Wall Bros., Kentish-town (accepted)..	593	0	0

TILBURY (Essex).—For diversion of drain, new culvert, &c., for the Lands Allotment Company. Mr. Bradshaw Brown, Fenchurch-street, surveyor :—

Pearce	£655	15	6
Marshall	645	0	0
Newman, Deptford	595	0	0
Williams	568	1	3
Belgeorge	549	0	0
Kirk Bros.	510	0	0

WALTHAMSTOW.—For the construction of surface soil and water sewers, for the Walthamstow Local Board. Mr. G. B. Jerram, A.M.I.C.E., engineer :—

Butler	£12,450	0	0
E. Bentley	10,600	0	0
Bottoms Bros.	10,372	0	0
Botterill	10,096	0	0
J. Mackay	10,034	13	8
J. W. Stuart	9,897	16	2
Currell & Lewis	9,739	6	0
C. Killingback	9,400	0	0
North British Plumbing Company...	9,064	15	0
J. Bloomfield	8,692	0	0
J. W. & W. Neave	8,622	0	0
Geo. Cawdray & Sons	8,599	7	0
Adams	8,547	14	8
B. Cook & Co.	8,108	0	0
Geo. Bell	8,074	0	0
Jesse Jackson	7,999	0	0
Eli Wilson, Walthamstow*	7,921	0	0

* Accepted.

WALTHAMSTOW.—For the erection of engine and boiler-house, mixing-shed, low-level tank, and sewer, for the Walthamstow Local Board. Mr. G. B. Jerram, A.M.I.C.E., engineer :—

J. Bloomfield	£4,406	0	0
E. Bentley	4,000	0	0
Botterill	3,966	0	0
Currell & Lewis	3,963	11	0
J. W. & W. Neave	3,919	0	0
J. Mackay	3,906	0	6
Bottoms Bros.	3,814	0	0
Geo. Bell	3,604	0	0
C. Killingback	3,600	0	0
B. Cook & Co.	3,551	0	0
E. Good	3,489	0	0
J. Argood	3,350	0	0
Adams	3,467	18	5
Jesse Jackson	2,699	0	0
Eli Wilson, Walthamstow*	2,689	0	0

* Accepted.

WALTHAMSTOW.—For two houses and shops, for Mr. Joseph Edwards. Mr. W. Smith, Gresham-buildings, architect :—

Read	£1,816	0	0
Richardson	1,774	0	0
Anley	1,645	0	0
Hurst	1,643	0	0
Shurmer	1,635	0	0
Scott	1,593	0	0
Lark & Sons	1,529	0	0
Fuller	1,485	0	0
Mattock Bros.	1,475	0	0
Killingback	1,459	0	0
Dunford & Langham	1,450	0	0
Clarke Bros.	1,398	0	0
Chant	1,390	0	0

WHETSTONE.—For detached house, Oakleigh Park, for Mr. Palmer. Mr. J. William Stevens, architect, New Bridge-street :—

Life, Southgate	£1,859	0	0
Knight, Southgate	1,851	0	0
Noble, Barnet	1,775	0	0
Staines & Son, London	1,584	0	0
J. & C. Bowyer, Upper Norwood ...	1,548	0	0
Prestige & Co., Pimlico	1,488	0	0
Grover & Sons, Islington	1,484	0	0
Curnow, Barnet	1,440	0	0
Johnstone, Limehouse	1,430	0	0
Smith & Sons, South Norwood*	1,416	0	0

* Accepted.

WIMBLEDON.—For the erection of a Free Public Library, at Wimbledon, Surrey. Messrs. Potts, Sulman, & Hennings, architects. Quantities by Mr. G. Fleetwood :—

Jones, Gloucester	£2,885	0	0
Schofield, Swansea	2,879	4	6
Balsam, Old Kent-road	2,770	0	0
Reynolds, Brighton	2,694	0	0
Ackerman, Wimbledon	2,513	0	0
Gibbs & Flew, Kensington	2,500	0	0
Harmer, Wimbledon	2,480	0	0
Angood, Finsbury Park	2,384	0	0
Roberts, South Norwood	2,378	9	10
Potterton, Gould, & Co., Hampton Court	2,362	13	0
Harris, Sutton	2,190	0	0
Johnson, Wimbledon	2,165	0	0

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A. H. T.—H. G. F.—P. P.—W. G. M.—C. A. D. (thanks; not required).—W. D.—"Design for a Wooden Tomb Canopy" (name and address of sender absolutely illegible).

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